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ABSTRACT

The National Highway Traffic Safety Administration's (NHTSA) Driver Education Evaluation Program and this initial report to Congress on that program are concerned with the first countermeasure within the driver programing area. Primary concern in this report is to provide the following information: (1) the context within which the driver education effort exists; (2) the case against the young driver as the primary target group for driver education efforts; (3) a brief description of the implementation history of driver education efforts (primarily in the form of high school driver education programs); (4) an assessment of the effectiveness of driver education programs from the standpoint of highway safety; (5) a summary of the primary issues being raised in the driver education area at present; and (6) a review of NHTSA-supported efforts in this area. (Author/RC)

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THE
DRIVER EDUCATION EVALUATION PROGRAM (DEEP) STUDY

A REPORT TO THE CONGRESS

July 1975

U.S. Department of Transportation

National Highway Traffic Safety Administration

TM 005 997

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
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PREFACE

The present report has been prepared in response to Section 226 of the Federal-Aid Highway Act of 1973 (P.L. 93-87), which is reproduced below.

Driver Education Evaluation Program

Sec. 226.(a) Section 403 of title 23, United States Code, is amended by adding at the end thereof the following new subsection:

> "(f) In addition to the research authorized by subsection (a) of this section, the Secretary shall carry out research, development, and demonstration projects to improve and evaluate the effectiveness of various types of driver education programs in reducing traffic accidents and deaths, injuries and property damage resulting therefrom. The research, development, and demonstration projects authorized by this subsection may be carried out by the Secretary through grants and contracts with public and private agencies, institutions, and individuals. The Secretary shall report to the Congress by July 1, 1975, and each year thereafter during the continuance of the program, on the research, development, and demonstration projects authorized by this subsection, and shall include in such report an evaluation of the effectiveness of driver education programs in reducing traffic accidents and deaths, injuries, and property damage resulting therefrom."

In response to the requirements of this section of the act, this report has been organized as follows:

- Section one provides a brief synopsis of the findings of the study.
- Section two describes the highway safety context within which driver education must function.
- Section three provides an overall discussion of the potential traget groups for driver education efforts, their contribution to highway crashes, and the particular problem characteristics of each group.
- Sections four and five are devoted exclusively to high school driver education efforts. Section four provides a brief description of the implementation history of such programs, and section five provides a summary of past attempts to evaluate such efforts.
- Section six provides a followup to section five by elaborating on the major problems involved in attempting to evaluate secondary school driver education programs. The second half of section six then expands the report to include major non-NHTSA activities in other areas of driver education (e.g., adult, elderly, drinking, and handicapped driver education efforts).
- Sections seven and eight are most central to the requirements of the act, in that they describe NHTSA's efforts to develop and evaluate driver education programs. Section seven addresses itself solely to efforts within the high school driver education area, and section eight provides a description of NHTSA driver education efforts in the broader traffic safety education area.
- Section nine provides a section-by-section summary of findings as well as recommendations for future efforts in this area. These recommendations cover both evaluation and program development efforts for both NHTSA and State programs.

THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

July 24, 1975

Honorable Carl Albert
Speaker of the House of
  Representatives
Washington, D. C. 20515

Dear Mr. Speaker:

Enclosed is the first annual report from the Driver Education Evaluation Program (DEEP), required by section 226 of the Highway Safety Act of 1973. This report includes a comprehensive summary of the history, issues and effectiveness of a broad range of driver education programs along with recommendations for future efforts in this area.

Sincerely,

William T. Coleman, Jr.
William T. Coleman, Jr.

Enclosure

TABLE OF CONTENTS

Page

Section One: Synopsis 1

Section Two: An Introduction to the Highway Safety Problem and Potential Measures to Counteract It 3

A. The Highway Safety Context Within Which Driver Education Must Operate 3
B. Countermeasure Approaches Available 6

Section Three: Target Populations: The Case Against the Young Male Driver 7

A. An Overview of Potential Traffic Safety Education Target Groups 7
B. Young Drivers and Their Crash Records 7
  Proportion of Licensed Drivers 7
  Proportion of Fatalities 9
  Summary of Crash and Violation Data 10
C. Other Characteristics of Young Driver Problems 11
  The Nighttime, Single-Vehicle, Alcohol Relationship 11
  Young Driver Errors and Violations 13
  Use of High-Risk Vehicles 17
  Personal-Biographical Characteristics 18
D. Elderly Drivers 18
E. Motorcycle Operators 19
F. Problem and Near-Problem Drivers 20
G. Drinking Drivers 21
H. All Drivers 21

Section Four: A Historical View of High School Driver Education in the United States . . . 25

A. Introduction 25
B. A Chronological Summary of the History of HSDE 25
C. Phases of HSDE 27
D. National and Federal Events in the History of HSDE 28
E. Status of the Implementation of HSDE Programs 29

Section Five: Studies of the Effectiveness of High School Driver Education Programs 33

A. Introduction 33
B. Early Studies by Proponents of HSDE 33
C. Studies by Independent Researchers 34
D. Studies Conducted Since the 1968 Implementation of the NHTSA Research and Development Program 35

Section Six: Issues and Activities in High School and Other Driver Education Areas 39

A. Evaluation Issues 39
  Problems in the Development of HSDE 39
  Requirements for Evaluating HSDE 39
  Evaluation Criteria and the Problems Involved 42
B. High School Driver Education Issues 43
  Teacher Preparation 43
  Time Allocation and Course Content 45

TABLE OF CONTENTS (Continued)

Page

C. Other Driver Education Activity Areas 46
    Adult Driver Education 46
    Elderly Driver Programs 49
    Motorcycle Education Programs 49
    Driver Education for the Handicapped 50
    Problem Driver Education Programs 51
    Educational Programs for Drinking Drivers 52

Section Seven: NHTSA Efforts in the Development and Evaluation of a Model Driver Education Program 53

A. Introduction 53
B. Early Planning Studies in NHTSA's Driver Education Evaluation Program 53
C. Initial Task Analysis Project Awarded in Response to the HRB Plan 55
D. Additional Attempts to Develop Improved Performance Measurement Methods 56
E. Content Analysis of Existing Programs 56
F. Development of SPC 57
G. A Pilot Test of SPC 59
H. Demonstration of SPC in Terms of Ultimate Criterion Measures 61
I. The Potential Impact of the SPC Program in Reducing Crashes 66

Section Eight: NHTSA Efforts in Other Driver Education Areas 69

A. Past and Present Research and Development Projects 69
    Young Driver Programs 69
    Young Handicapped Drivers 69
    Adult Driver Education 70
    Motorcycle Driver Education 72
    Alcohol-Related Educational Programs 74
B. Future Plans in the Driver Education Area 78

Section Nine: Summary and Recommendations 83

A. Summary 83
    Section Two: Context 83
    Section Three: Target Groups 83
    Section Four: History 83
    Section Five: Effectiveness of HSDE 84
    Section Six: Issues 84
    Section Seven: NHTSA Approach to Evaluating the HSDE Area 85
    Section Eight: Other NHTSA Education Activities 85
B. A General Observation 85
C. Recommendations 86

References 89

Appendix A: Highway Safety Program Standard 4—Driver Education 99

Appendix B: Statutory Authority for the Highway Safety Standard on Driver Education . . 101

6

LIST OF ILLUSTRATIONS

Figure	Title	Page
1	Approximate Proportion of Licensed Drivers Involved in Various Types of Crashes in Any One Year	4
2	Highway Fatality Rates of Various Motorized Nations	5
3	Motor Vehicle Population Death Rates for Different Age Groups, 1949-69	11
4	Age Distribution of Drivers Using the Road at Night in Seven Areas of the United States	12
5	Distribution of Highway Accidents by Hour Group for Each Type Of Collision	14
6	Comparison of Alcohol-Involved and Non-Alcohol-Involved Crashes Based on the Distribution of Crashes by 2-Hour Periods During the Week	15
7	Blood Alcohol Level in Fatally Injured Drivers at Fault and Not At Fault	16
8	Accident Vulnerability as a Function of Age and BAC in Men	17
9	Distribution of Alcohol-Related Problems and Alcohol-Related Crashes by Age Group	18
10	Number of Students Enrolled in HSDE and Number of Schools Offering HSDE from School Year 1961-62 to School Year 1972-73	30
11	Proportion of Students Enrolled in Various Types of HSDE Program Components in 1972-73 School Year	31
12	An Idealized Model for Developing and Implementing High School Driver Education	40
13	Control Group Methodology for Evaluating Program Effect	41
14	History of the Safe Performance Curriculum (SPC) Development and Evaluation	54
15	Relationship Between Various Modes of the SPC Curriculum and Their Objectives	58
16	Results of the Analysis of Intermediate Pilot-Test Measures for the SPC and PDL Curricula	62
17	Percent Correct Responses for Various Curriculum Units Included in the SPC Pilot Evaluation	63
18	Experimental Design for the Demonstration of the SPC Curriculum	65

LIST OF ILLUSTRATIONS (Continued)

Figure	Title	Page
19	Model for Estimating Program Impact	67
20	Experimental Design for the Young Problem Driver Demonstration Project	73
21	Results of the Analytic Studies of the Effectiveness of Alcohol Safety Schools	75
22	Rearrest Rates for Problem and Nonproblem Drinkers	77
23	Rearrest Rates for Problem and Nonproblem Drinkers Exposed to Various Types of Schools	79

Table		
1	A Summary of Estimated Crash Involvement for Various Target Groups	8
2	Proportion of Licensed Drivers Accounted for by Various Age Groups	9
3	Proportion of Male and Female Fatalities Accounted for by Various Age Groups	9
4	Proportion of Fatalities at Various Age Brackets Accounted for by Male Drivers	10
5	Estimates of the Proportion of Licensed Drivers and Total Crashes Accounted for by Various Problem Driver Types	20
6	Summary of Proportions of Crashes Accounted for by Various Crash Types	22
7	Fatalities and Fatality Rates by Day and Night	23
8	Proportion of Crashes Involving Various Types of Improper Driving	23
9	Time Spent in Instructional Modes, by Curriculum Units	60
10	Characteristics of Alcohol Education School Types	76

Section One

SYNOPSIS

High School Driver Education (HSDE) is only one of several countermeasures aimed at the driver in the highway traffic system. Other countermeasures aim at targets that include the highway (and its environmental context) and the vehicle. Effort should be expended in all three areas to maintain a maximally safe highway transportation system. Even then dramatic crash reductions are unlikely because much safety effort has already been expended in the United States, making the U.S. highway system the safest in the motorized world.

Formal driver education itself is only part of a comprehensive traffic safety education effort aimed at a variety of driver target groups that include young drivers, adult drivers, elderly drivers, drinking drivers, drivers of special vehicles, and youth of prelicensing ages. The HSDE program does have a high potential for successfully reducing crashes for a variety of reasons, which include: 1) the highest risk age group as target; 2) early intervention in driving experience; and 3) the substantial logic and face validity of training young drivers. In addition, HSDE undoubtedly provides a training service for society, in that it is a primary means by which nearly 75 percent of the Nation's youth gain the skills required to obtain their licenses.

After more than 50 years of HSDE, however—during which time it appears to have gone through phases of uncontrolled development, made futile attempts to maintain quality control, undergone extreme criticism, and, finally, shown significant signs of objective curriculum development and evaluation—its actual effectiveness as a crash reduction countermeasure is still undetermined. Early studies conducted in the 1950's and 1960's concluded that HSDE reduced crashes and violations by 50 percent among those persons exposed to it. These studies did not control for a variety of contaminating preselection factors, which were found by later investigation to account for most of the reported effect. Thus, their conclusions were incorrect.

Some critics have claimed that HSDE has no effect in reducing crashes, and has little potential for such an effect. Such claims also cannot be supported. Two obstacles standing in the way of adequate studies that could determine the effectiveness of HSDE are as follows: 1) It is the commonly accepted belief that HSDE is effective, which makes difficult the random exposure of some persons to HSDE while withholding it from others; and 2) variation in motor vehicle records, because of error and differential reporting procedures, may be as great as any crash reduction effect (variation) that HSDE may cause. The latter factor makes such records an extremely insensitive measure of any change that may occur.

The National Highway Traffic Safety Administration (NHTSA) has taken the position that a quality HSDE program is capable of a 10-15-percent effect in terms of reducing the probability of crash involvement among persons exposed to it. Such an effect would be cost effective in terms of those crash reduction savings gained in the first year after licensing alone. To document such an effect, as well as to stimulate improvements in the quality of existing HSDE programs, NHTSA has developed an objective- and performance-based curriculum called the Safe Performance Curriculum (SPC). An initial pilot test of SPC has indicated that it will be successful in meeting its instructional and performance objectives. The next step will be to demonstrate the crash reduction effectiveness of the program by exposing a randomly assigned group of potential students to SPC and comparing this group to a no-education control group. When and if a location can be found that can satisfy the requirements for an adequate research design, the demonstration project will be initiated.

A similar state of affairs exists in other safety education areas. Most such programs have, like HSDE, tended to be expanded before objective curriculum development and evaluation have taken place. One notable exception appears to be in the motorcycle driver education area, where early attempts were and are being made to develop quality instruction preparation programs, develop an objective-based curriculum, and evaluate the program using proper experimental design procedures.

The NHTSA has plans to stimulate improvement in the development and evaluation of education programs for a variety of target groups (i.e., young drivers, drinking drivers, motorcyclists, adult drivers, elderly drivers, and handicapped drivers) by developing safety education components for a series of demonstration programs in these areas.

Section Two

AN INTRODUCTION TO THE HIGHWAY SAFETY PROBLEM AND POTENTIAL MEASURES TO COUNTERACT IT

A. The Highway Safety Context Within Which Driver Education Must Operate

Usually, when highway safety problems are discussed, they are discussed in the context of absolute numbers. For example, in 1973 there were approximately–

- 55,800 highway fatalities
- 2,000,000 persons suffering disabling injuries resulting from highway crashes
- 15,300,000 property damage crashes
- $20,200,000,000 lost in highway crashes

In attempting to establish the need for highway safety it is simple to go even farther and make comparisons between highway crashes and other forms of national trauma. For example:

- Highway safety crashes are the leading cause of death for Americans under the age of 40.
- Highway crashes are the leading cause of *accidental* death for all ages.
- Highway crashes account for 94 percent of all transportation-related deaths in America.
- Highway crashes kill more Americans in 1 year than were killed in the Vietnam war in any 10 years.

It is reasonably apparent that transportation-related trauma is of significant social concern, and that the greater part of the problem lies with private vehicles operating on the Nation's highways. However, for a feel for how difficult it may be to modify the situation, or to assess the potential impact of any one program area (such as driver education), the problem must be looked at from another point of view–that of total system activity. For example, while those absolute figures and trauma relationships already cited are certainly factual, we must not lose sight of the additional fact that in 1974 there were approximately 122,400,000 licensed drivers who accounted for more than 1.2 trillion miles of travel. Thus, even though there were 55,800 fatalities, deaths per miles of travel amounted to less than one death for every 1,000 passenger trips around the world. Figure 1 points out a still different set of relationships, including the fact that according to National Safety Council figures (1):

- More than 78 percent of all licensed drivers in any one year are *not* involved in *any* type of crash.
- Approximately 98 percent of all licensed drivers in any one year do *not* suffer any form of serious injury resulting from an automobile crash.
- More than 99.95 percent of all licensed drivers in any one year are *not* killed in a *fatal* crash.

Looking at the problem in this light, it is apparent that the highway vehicle system is operating with a certain degree of efficiency. In fact, in terms of mileage crash *rates* (see fig. 2), the United States has by far the safest highway transportation system of any motorized nation in the world (2). This finding would appear to be reasonable, because the United States spends proportionately more time and effort on highway safety programs than do most other motorized nations as evidenced by the number of safety programs and organizations visible in the United States today. Thus, while traffic safety continues to be a problem, it is not an "untouched" problem, and therefore it is reasonable to assume that it will be more difficult to reduce the extent of the problem than if it were untouched.

Support for this type of interpretation can be found in a study of safety programs in the trucking industry (3). Basically, this study suggests that in companies (or nations) *without* traffic safety programs, crash involvement can be impacted more easily than in companies (or nations) with

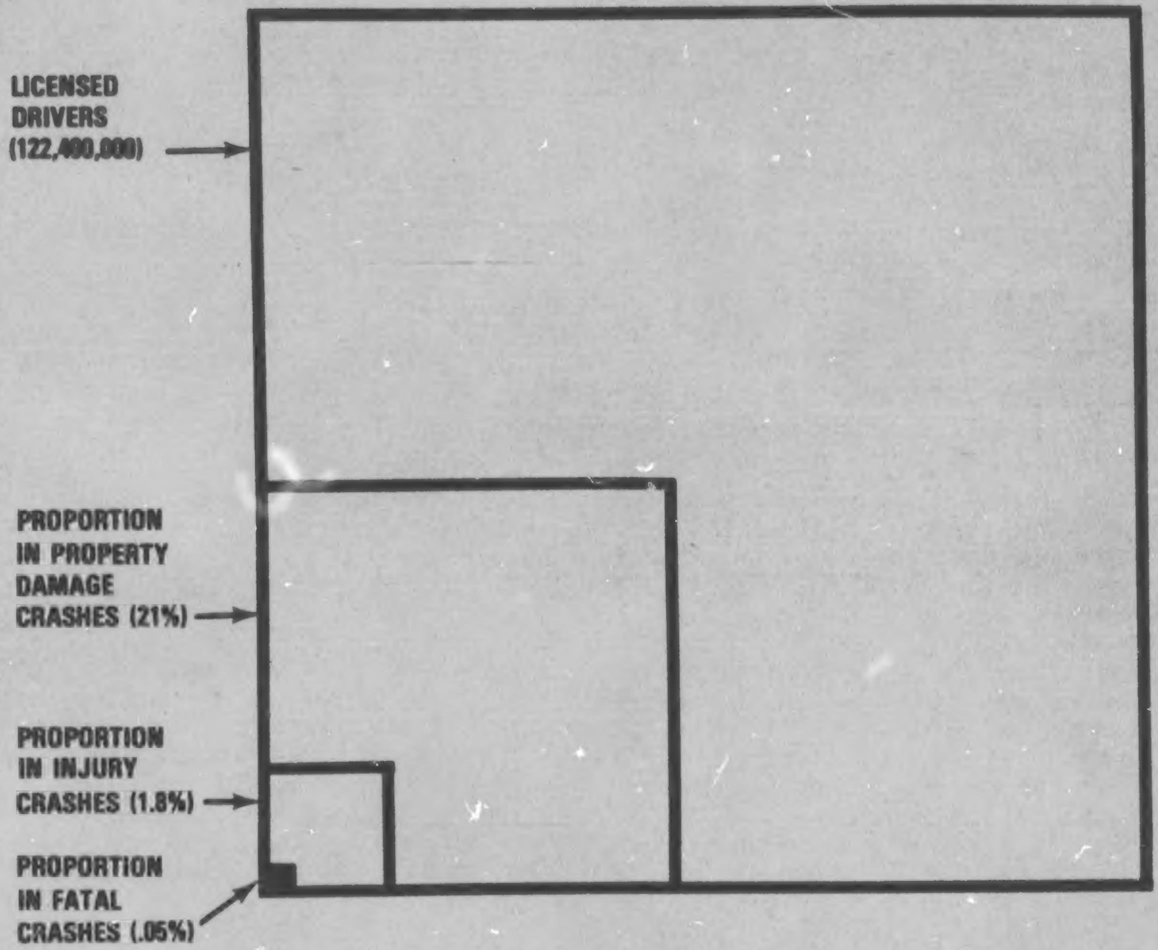
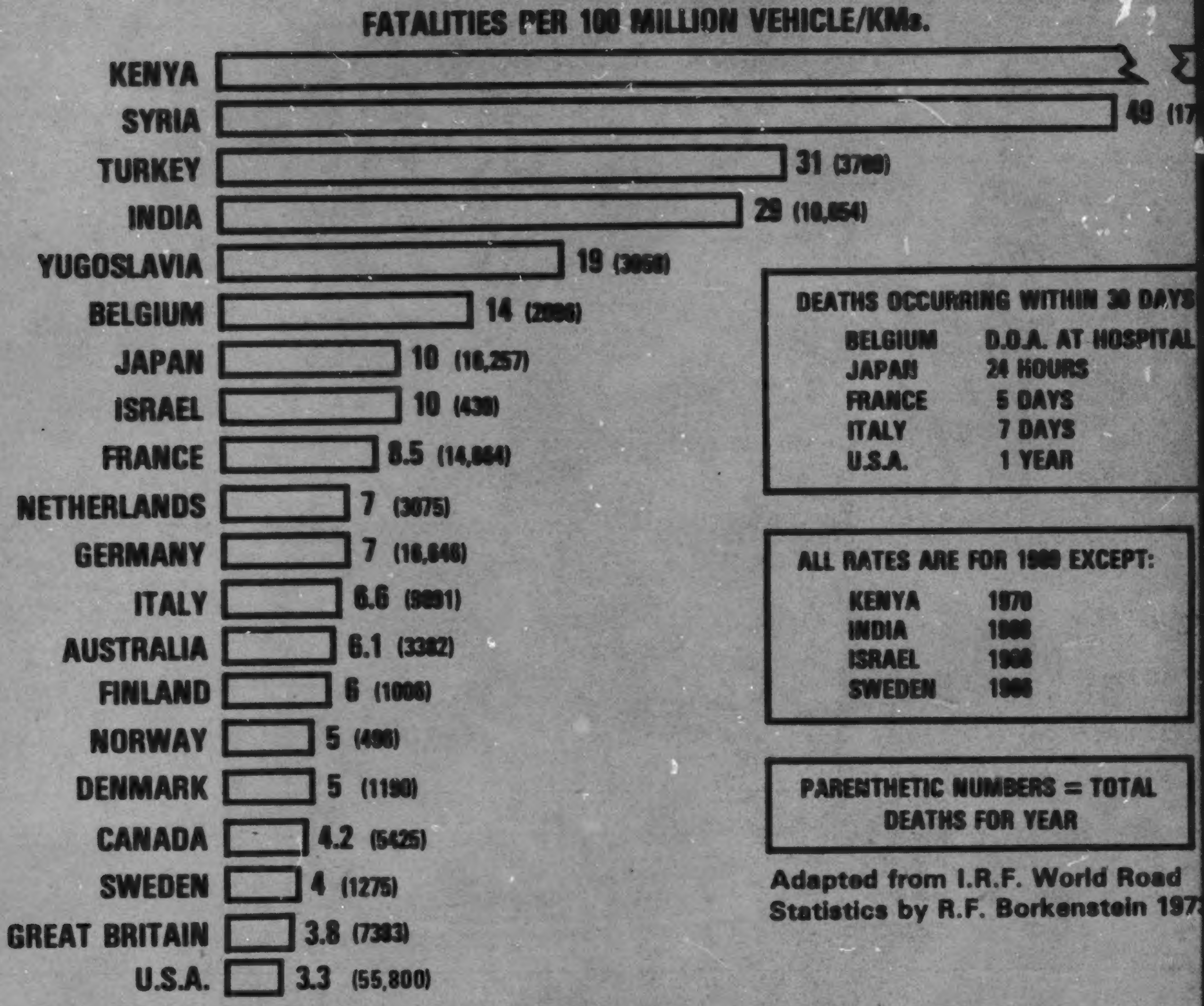


Figure 1

APPROXIMATE PROPORTION OF LICENSED DRIVERS INVOLVED IN VARIOUS TYPES OF CRASHES IN ANY ONE YEAR

existing safety programs. Thus, while substantial efforts will be required even to maintain whatever safety climate exists on the roadway today, significantly more effective programs must be developed and implemented in an attempt to improve further the situation, and it can be expected that in the future crash rate reductions will be more difficult to effect than in the past.

The probability of involvement in a crash at any one time is already relatively low and quite difficult to reduce. Significant reductions will probably require large-scale national approaches that have some *significant* impact on the Nation's drivers, in terms of either *how* they drive (e.g., using seat belts, minding speed limits) or *how much* they drive (e.g., in the recent fuel shortage).



DEATHS OCCURRING WITHIN 30 DAYS

BELGIUM	D.O.A. AT HOSPITAL
JAPAN	24 HOURS
FRANCE	5 DAYS
ITALY	7 DAYS
U.S.A.	1 YEAR

ALL RATES ARE FOR 1969 EXCEPT:

KENYA	1970
INDIA	1968
ISRAEL	1968
SWEDEN	1968

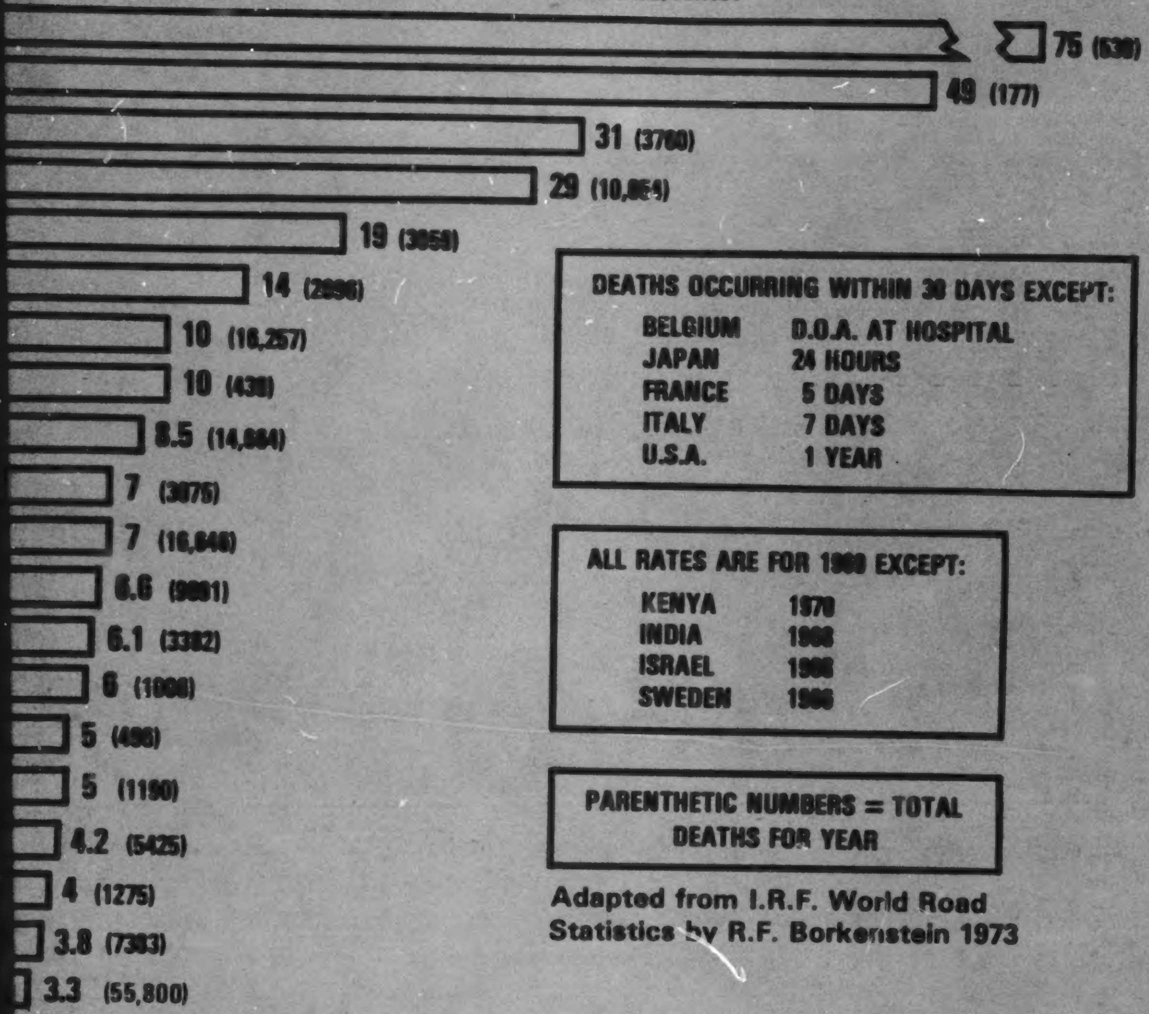
PARENTHETIC NUMBERS = TOTAL DEATHS FOR YEAR

Adapted from I.R.F. World Road Statistics by R.F. Borkenstein 197

Figure 2

HIGHWAY FATALITY RATES OF VARIOUS MOTORIZED NATIONS

FATALITIES PER 100 MILLION VEHICLE/KMs.



DEATHS OCCURRING WITHIN 30 DAYS EXCEPT:

BELGIUM	D.O.A. AT HOSPITAL
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KENYA	1970
INDIA	1968
ISRAEL	1968
SWEDEN	1966

PARENTHETIC NUMBERS = TOTAL DEATHS FOR YEAR

Adapted from I.R.F. World Road Statistics by R.F. Borkenstein 1973

Figure 2

HIGHWAY FATALITY RATES OF VARIOUS MOTORIZED NATIONS

B. Countermeasure Approaches Available

While there are probably innumerable crash countermeasure approaches available, they are usually classified as to whether they affect:

1. The driving environment
2. The vehicle being driven
3. The driver (and his passengers)

Some of these measures include the following:

- *The environment*
  - removing roadway hazards
  - improved roadway construction
  - improved lighting and signing
  - other environmental measures
- *The vehicle*
  - improved crash resistance
  - improved handling
  - improved occupant packaging
  - improved visibility
  - other vehicle measures
- *The driver*
  - improved driver education
  - improved driver licensing
  - improved safety legislation
  - improved traffic law enforcement
  - improved adjudication processes:
    - penal sanctions
    - nonpenal approaches

The National Highway Traffic Safety Administration's (NHTSA) Driver Education Evaluation Program and this initial report to Congress on that program are concerned with the first countermeasure *within* the *driver* programing area. Primary concern in this report will be to provide the following information:

1. The context within which the driver education effort exists (as already described in this section)
2. The case against the young driver as the primary target group for driver education efforts
3. A brief description of the implementation history of driver education efforts (primarily in the form of high school driver education programs)
4. An assessment of the effectiveness of driver education programs from the standpoint of highway safety
5. A summary of the primary issues being raised in the driver education area at present
6. A review of NHTSA-supported efforts in this area

Section Three

TARGET POPULATIONS: THE CASE AGAINST THE YOUNG MALE DRIVER

A. An Overview of Potential Traffic Safety Education Target Groups

Formal traffic safety education efforts can be and have been directed at a variety of target populations. Some of these target groups and the different approaches involved include the following:

- *Young drivers*
  - public school programs
  - commercial school programs
- *Adult drivers*
  - beginner programs (public and commercial)
  - refresher programs (e.g., defensive driving)
- *Drivers with disabilities*
  - learning disability programs
  - physical disability programs
- *Drivers of special vehicles*
  - commercial carrier programs
  - schoolbus driver programs
  - motorcyclist programs
  - bicyclist programs

Table 1 provides a summary of some of the more frequently discussed target groups for traffic safety education efforts; the proportion of all drivers, crashes, and fatal crashes accounted for by such groups; some general characteristics of the types of crashes these groups are most often involved in; and some factors that appear to contribute to crash involvement for each target group. One target group missing from this matrix involves "all drivers" who account for 100 percent of all fatal and nonfatal crashes. This group is the primary target of many advanced or adult driver education programs. This section, however, will concentrate primarily on the subpopulation with the greatest overinvolvement in highway crashes–the young driver (aged 16-24).

B. Young Drivers and Their Crash Records

Proportion of Licensed Drivers

Table 2 shows the breakdown of licensed drivers in the United States according to National Highway Traffic Safety Administration (NHTSA) estimates (13). As table 2 indicates, drivers under the age of 25 constitute approximately 22.3 percent of the total driving population. This figure can be broken down further to those drivers under the age of 20, who constitute 8.7 percent of the total driving population, and those drivers aged 20-24, who constitute 13.6 percent of the total. Males and females account for approximately equal proportions of the driving population in all age groups. However, there are slightly *more* females in the younger age brackets and slightly *fewer* females after age 55.

Table 1

A SUMMARY OF ESTIMATED CRASH INVOLVEMENT FOR VARIOUS TARGET GROUPS

TYPE OF DRIVER	PERCENT INVOLVEMENT			MAJOR TYPES OF CRASHES INVOLVED IN	PROBABLE FACTORS INVOLVED IN PROBLEMS
	LICENSED DRIVERS	ALL CRASHES	FATAL CRASHES		
YOUNG DRIVERS (15-24)	21.7	38.4	37.7	SINGLE VEHICLE •FIXED OBJECT •RUN OFF ROAD	INEXPERIENCE SPEED RISK TAKING ALCOHOL
ELDERLY DRIVERS (> 60)	13.8	18.3	11.5	MULTIPLE VEHICLE FIXED OBJECT	SENSORY AND SKILL PROBLEMS ALCOHOL, COORDINATION
MOTORCYCLISTS	3.3	1.4	4.7	MULTIPLE VEHICLE SINGLE VEHICLE	LOW VISIBILITY LOW PROTECTION FACTOR
HANDICAPPED PHYSICAL	N/A	N/A	N/A	N/A	EQUIPMENT PROBLEMS DECREASED MANIPULATIVE SKILL
MENTAL	N/A	N/A	N/A	N/A	UNDERSTANDING ABSTRACT IDEAS

Table 1

OF ESTIMATED CRASH INVOLVEMENT FOR VARIOUS TARGET GROUPS

ENT INVOLVEMENT		MAJOR TYPES OF CRASHES INVOLVED IN	PROBABLE FACTORS INVOLVED IN PROBLEMS	REFERENCES
ALL CRASHES	FATAL CRASHES			
38.4	37.7	SINGLE VEHICLE •FIXED OBJECT •RUN OFF ROAD	INEXPERIENCE SPEED RISK TAKING ALCOHOL	(1,4,5)
18.3	11.5	MULTIPLE VEHICLE FIXED OBJECT	SENSORY AND SKILL PROBLEMS ALCOHOL, COORDINATION	(1,6)
1.4	4.7	MULTIPLE VEHICLE SINGLE VEHICLE	LOW VISIBILITY LOW PROTECTION FACTOR	(7,8,9)
N/A	N/A	N/A	EQUIPMENT PROBLEMS DECREASED MANIPULATIVE SKILL	(10,11,12)
N/A	N/A	N/A	UNDERSTANDING ABSTRACT IDEAS	

Table 2

PROPORTION OF LICENSED DRIVERS ACCOUNTED FOR BY VARIOUS AGE GROUPS

AGE

DRIVERS	UNDER 25	25-34	35-44	45-54	55-64	OVER 65
MALE DRIVERS	22%	21%	17%	17%	13%	11%
FEMALE DRIVERS	23%	22%	18%	17%	12%	8%
TOTAL DRIVERS	22%	21%	18%	17%	13%	9%

Source: Voas (15)

Proportion of Fatalities

In terms of fatal and other crashes, however, the proportions accounted for by young drivers are quite different. For example, drivers under the age of 25 account for approximately 38 percent of the Nation's traffic fatalities. Table 3 shows this breakdown by age group for both male and female fatalities (13, 14).

It is apparent that, for both male and female fatalities, the proportion accounted for by the under-25 age group is disproportionate to the proportion of licensed drivers in this age group (77

Table 3

PROPORTION OF MALE AND FEMALE FATALITIES ACCOUNTED FOR BY VARIOUS AGE GROUPS

AGE

DRIVERS	UNDER 25	25-34	35-44	45-54	55-64	OVER 65	UNKNOWN
MALE FATALS	39%	19%	12%	11%	8%	10%	1%
FEMALE FATALS	33%	17%	14%	13%	10%	13%	1%
TOTAL FATALS	38%	18%	12%	12%	9%	11%	1%

Source: Voas (15)

percent overinvolvement for males and 43 percent overinvolvement for females). As table 4 indicates, the majority of fatalities at any age group are accounted for by males. It should also be pointed out that males have more nighttime than daytime fatalities (17 percent more), while females have 72 percent more daytime than nighttime fatalities (13, 14).

As a summary to the above statistics, figure 3 shows the *population death rates* for motor vehicle crashes over the past 20 years for four major age groups. From this figure it can be seen that the population death rate for the 15-24 age group is by far the highest and appears to be widening (15).

Summary of Crash and Violation Data

Goldstein (16), in a 1973 review of the young driver problem, reviewed several studies of violations, convictions, and crashes involving various age groups. The conclusions found in this review summarize the above data presentation as well as studies conducted in other areas. Some of these conclusions are as follows:

1. Young drivers have higher mean rates of both accidents and convictions than older drivers, per year and per mile.
2. This conclusion holds for both sexes. Young drivers drive fewer miles per year than do older drivers; males drive more miles per year than females in all age ranges (i.e., differential quantitative exposure).
3. Males have more convictions per year than females for all age groups, but the difference is especially high for the youngest age groups (i.e., 16-19 and 20-24).
4. Males have more accidents per year than females for all age ranges; in per mile terms, however, this difference disappears, with females having even higher per mile rates in some age ranges.
5. The correlation between accidents and convictions is higher for young drivers (16-20) than for older drivers.
6. The number of accidents per conviction is higher for young drivers than for the full age range for all classes of violations. This rate decreases with increasing numbers of convictions for all age groups; the figures for young males and young females are quite similar.

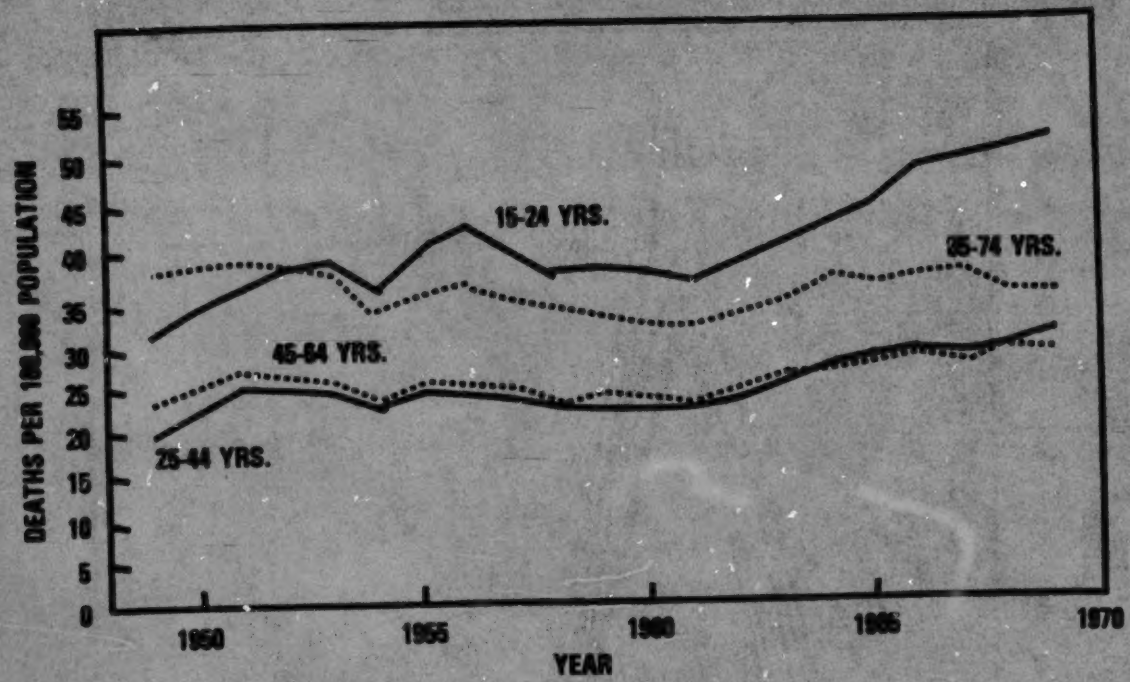
One point should be made that the Goldstein review does not include, and that may be of considerable importance in explaining the crash overinvolvement of young drivers. While it is true, as Goldstein states, that young drivers usually drive fewer miles per year than their older counterparts (lower *quantitative* exposure as per self-reported mileage rates), NHTSA roadside surveys have indicated that young drivers are greatly overrepresented on the highway during the high-risk nighttime

Table 4

PROPORTION OF FATALITIES AT VARIOUS AGE BRACKETS ACCOUNTED FOR BY MALE DRIVERS

AGE	UNDER 25	25-34	35-44	45-54	55-64	OVER 65	UNKNOWN
% MALES	83.8	82.8	78.4	79.1	80.5	76.4	80.1

Source:Voas (15)
NHTSA Data Systems



Source: National Safety Council

Figure 3

MOTOR VEHICLE POPULATION DEATH RATES
FOR DIFFERENT AGE GROUPS, 1949-69

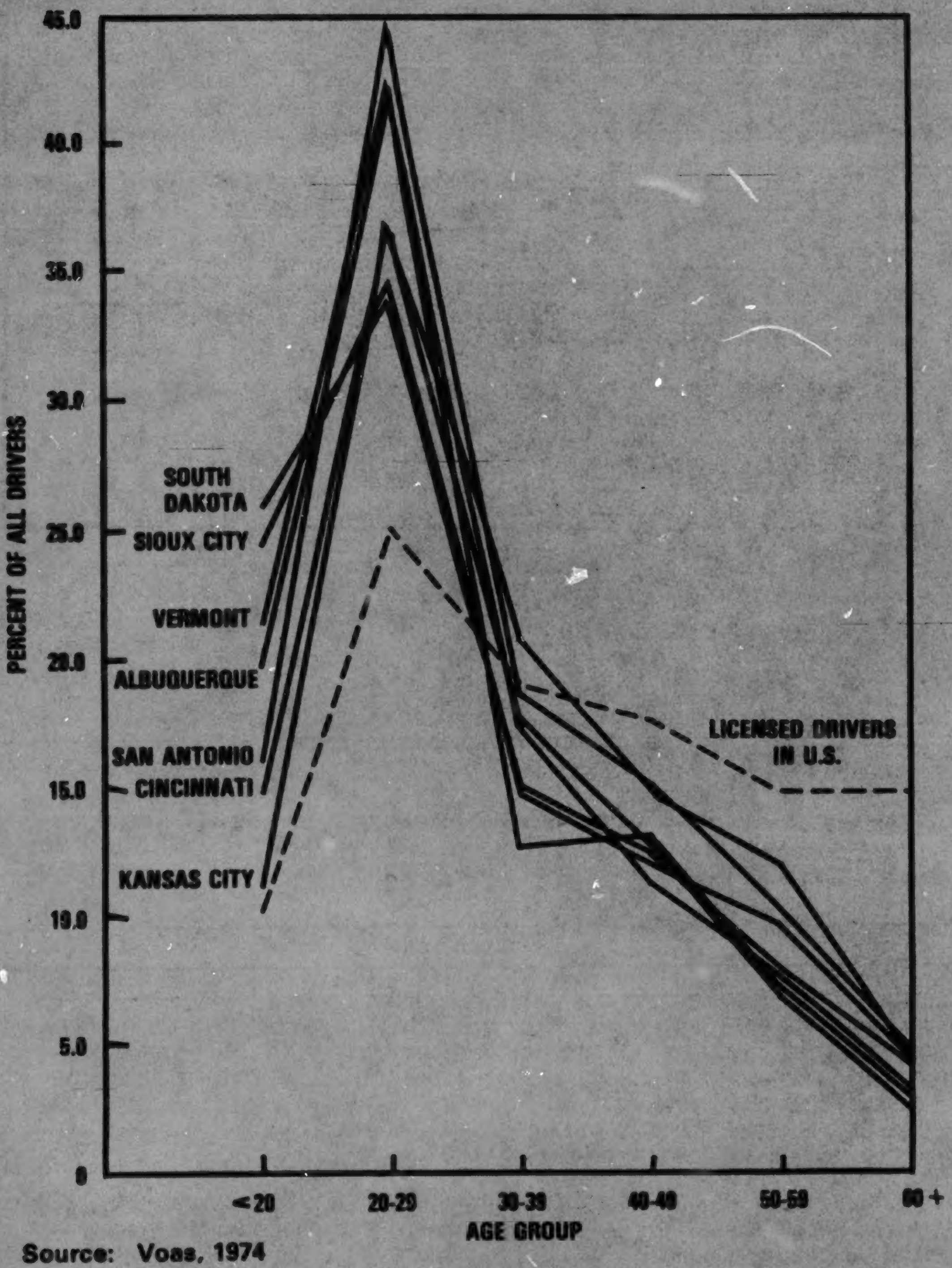
hours. Thus, they are *over*exposed during these high-risk hours. Figure 4 shows this higher *qualitative* exposure for young drivers quite clearly. This factor is discussed more completely by Voas (14).

C. Other Characteristics of Young Driver Problems

The 1973 Goldstein report (16) summarizes, perhaps better than any other to date, many of the characteristics affecting young driver crash involvement. Basically, these factors involve: (1) overinvolvement in *single-vehicle* and *nighttime* crashes; (2) particular types of driver *errors* and *violations* committed by young drivers; (3) involvement with *high-risk vehicles* such as motorcycles; (4) the use of *alcohol* (and other drugs); and (5) various *personal* and biographical factors. A brief elaboration of some of these descriptive areas follows.

The Nighttime, Single-Vehicle, Alcohol Relationship

It has already been shown that young driver involvement is greater for *nighttime* crashes than for daytime crashes. It has also been indicated that this relationship holds only for young male drivers (who account for approximately 80 percent of the crash problem at all age levels) and not for young females. Goldstein also points out that young drivers are disproportionately involved in *single-vehicle* crashes, which is quite logical because, as figure 5 illustrates, nonpedestrian single-vehicle crashes peak during nighttime hours (13).



Source: Voas, 1974

Figure 4

AGE DISTRIBUTION OF DRIVERS USING THE ROAD AT NIGHT
IN SEVEN AREAS OF THE UNITED STATES

A further relationship involves the fact that most *alcohol*-related crashes occur at night (17), as is shown in figure 6. While young driver fatal crashes do not more frequently involve alcohol than adult fatal crashes (there is some overlap, of course), young drivers appear to be involved in crashes at somewhat lower blood-alcohol concentrations (BAC's) than older drivers. Figure 7 shows the results of a study conducted in Baltimore, Maryland (18), which illustrates this relationship.

The relative probability of crash involvement as a function of age and BAC level is presented in figure 8 and reflects an analysis of data taken from a study conducted in Grand Rapids, Michigan (19). In this figure the data for crash-and non-crash-involved drivers are analyzed as a function of age and BAC. When "accident vulnerability" (crash involvement as a function of exposure) is plotted against age, a U-shaped curve results that indicates that at zero BAC young drivers (age 18-19) appear to have slightly greater accident vulnerability than middle-aged drivers (20-65), and the driving risk rises slightly again in the older ages (70 and over).

The presence of alcohol seems to magnify these trends. Even low levels of alcohol (between 0.01 percent and 0.04 percent) significantly increase the accident vulnerability of the 18- and 19-year-olds and of those over 70. However, this level of alcohol seems to cause little increase in accident vulnerability for drivers between 20 and 65.

At BAC levels between 0.05 percent and 0.09 percent the young drivers (18-19) are even more impaired. In this BAC range there is some evidence of slight impairment at all age levels. Once again, however, these levels appear to be related to age, with the greatest effect occurring for younger and older drivers. The data suggest that when both driving exposure and alcohol consumption are equated, young drivers and elderly drivers are more likely than their middle-aged counterparts to become involved in crashes.

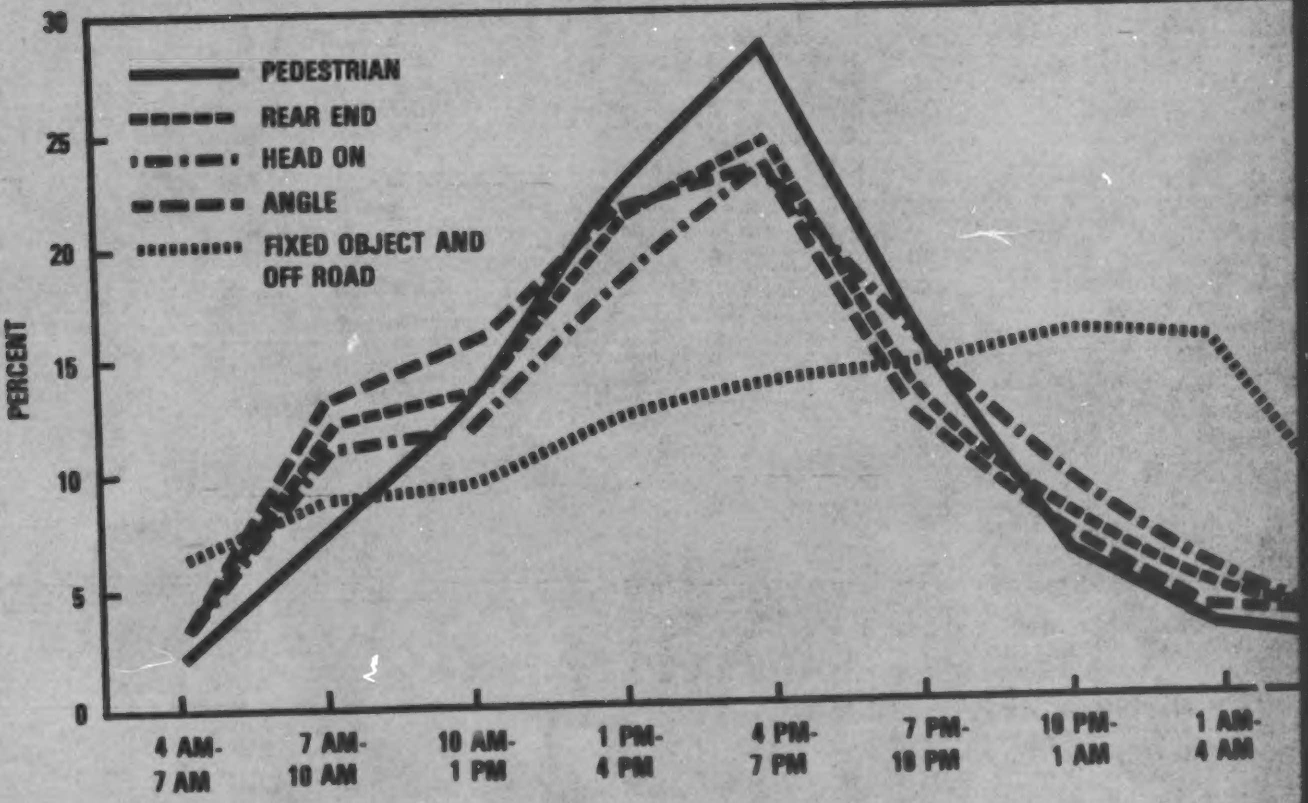
These data correspond with our natural expectations. The young driver is less experienced and more prone to taking risks and, thus, would be expected to have a higher crash rate, with or without alcohol. At the other end of the scale, the elderly driver is more likely to have some deterioration in physical capability and, therefore, we would expect him to have a higher crash involvement. The use of alcohol appears to exaggerate these trends; its apparent effect is to accentuate the weaknesses that are already present. Thus, alcohol use has its greatest effect upon those segments of the driving population whose normal hazard risk is already highest and its least effect upon those whose sober crash liability is already the lowest.

Young Driver Errors and Violations

With regard to the *errors* of young drivers, the Goldstein paper (16) suggests that the major types of errors that differentiate younger drivers from older drivers involve overtaking other vehicles, losing control, swerving, skidding, and speeding. In fact, speeding was considered to be a prime factor contributing to young driver, at-fault crashes. Teenage drivers also appear to be responsible for significantly more crashes resulting from fatigue or falling asleep. Again, this finding would appear to be reasonable in view of the fact that young (male) drivers are overinvolved in both nighttime exposure and in nighttime crashes. To the extent that alcohol is involved, the relationship between alcohol and nighttime crashes also contributes to this phenomenon.

The relationship between speed and young driver errors, of course, carries over into the violation area where the most common infractions were committed by young drivers, according to a 1970 California study (20), including: speeding, equipment, sign, passing, turning, right-of-way, and "major" violations.

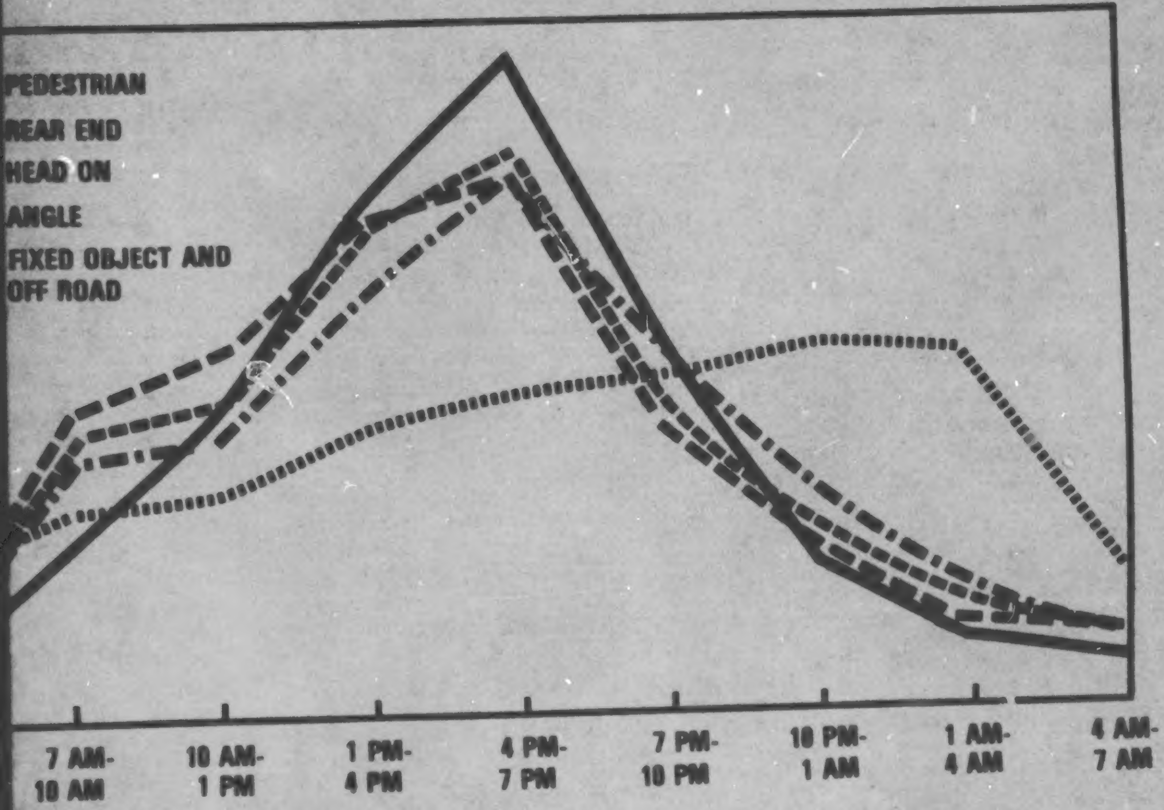
Speeding appears to be the most common traffic law violation committed by young drivers, and is probably related to the energetic aggressiveness characteristic of the young male driver population. Just how extensively this phenomenon is related to the aggressive and generally deviant driving



*NHTSA National Accident Summary File, 26 States, 2½ Million Accidents

Figure 5

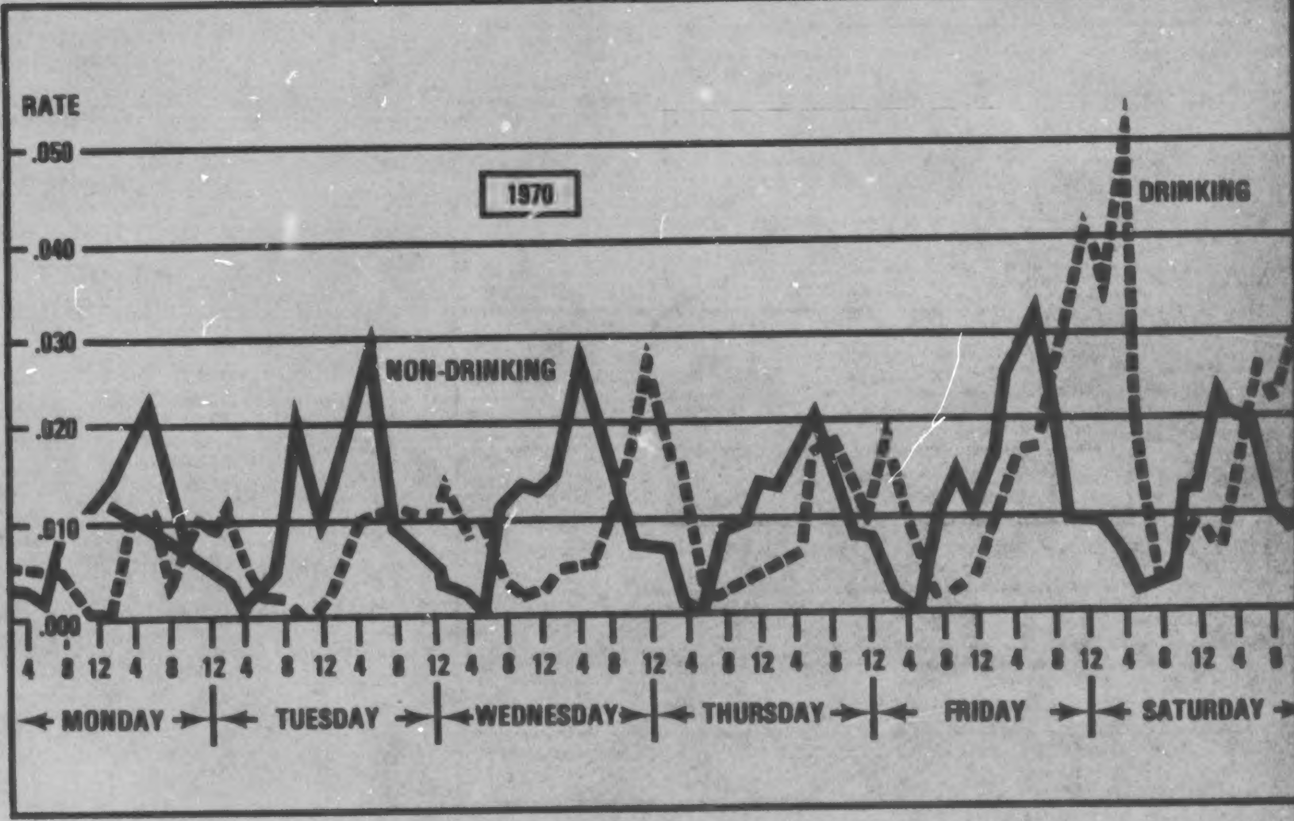
DISTRIBUTION OF HIGHWAY ACCIDENTS BY HOUR GROUP FOR EACH TYPE OF COLLISION*



Accident Summary File, 26 States,
nts

Figure 5

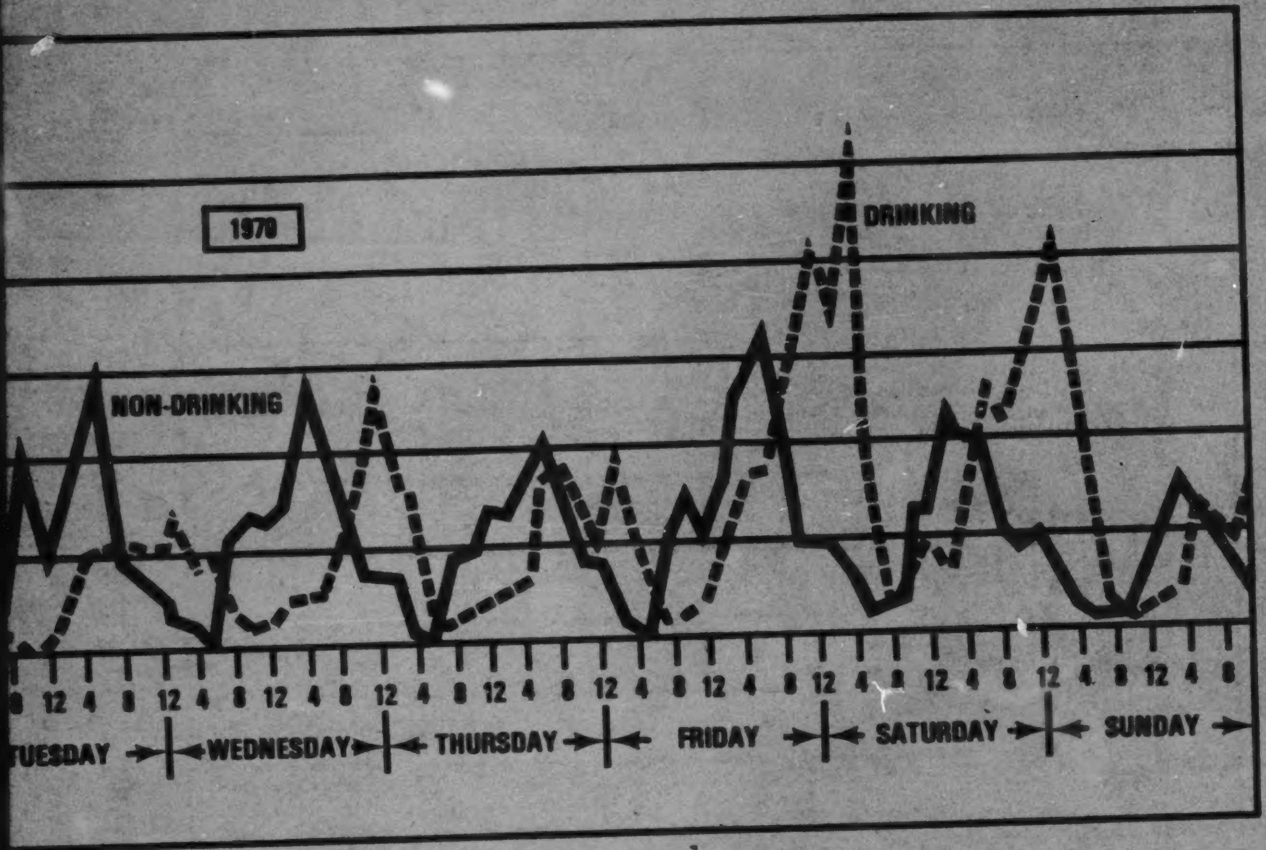
DISTRIBUTION OF HIGHWAY ACCIDENTS BY HOUR GROUP
FOR EACH TYPE OF COLLISION*



Source: Epstein, J.D. Univ. of Mich., HSRI HIT Lab. Reports 1-7, August 1971

Figure 6

COMPARISON OF ALCOHOL-INVOLVED AND NON-ALCOHOL-INVOLVED CRASHES BASED ON THE DISTRIBUTION OF CRASHES BY 2-HOUR PERIODS DURING THE WEEK



D. Univ. of Mich., HSRI HIT Lab. Reports 1-7, August 1971

Figure 6

OF ALCOHOL-INVOLVED AND NON-ALCOHOL-INVOLVED CRASHES BASED ON
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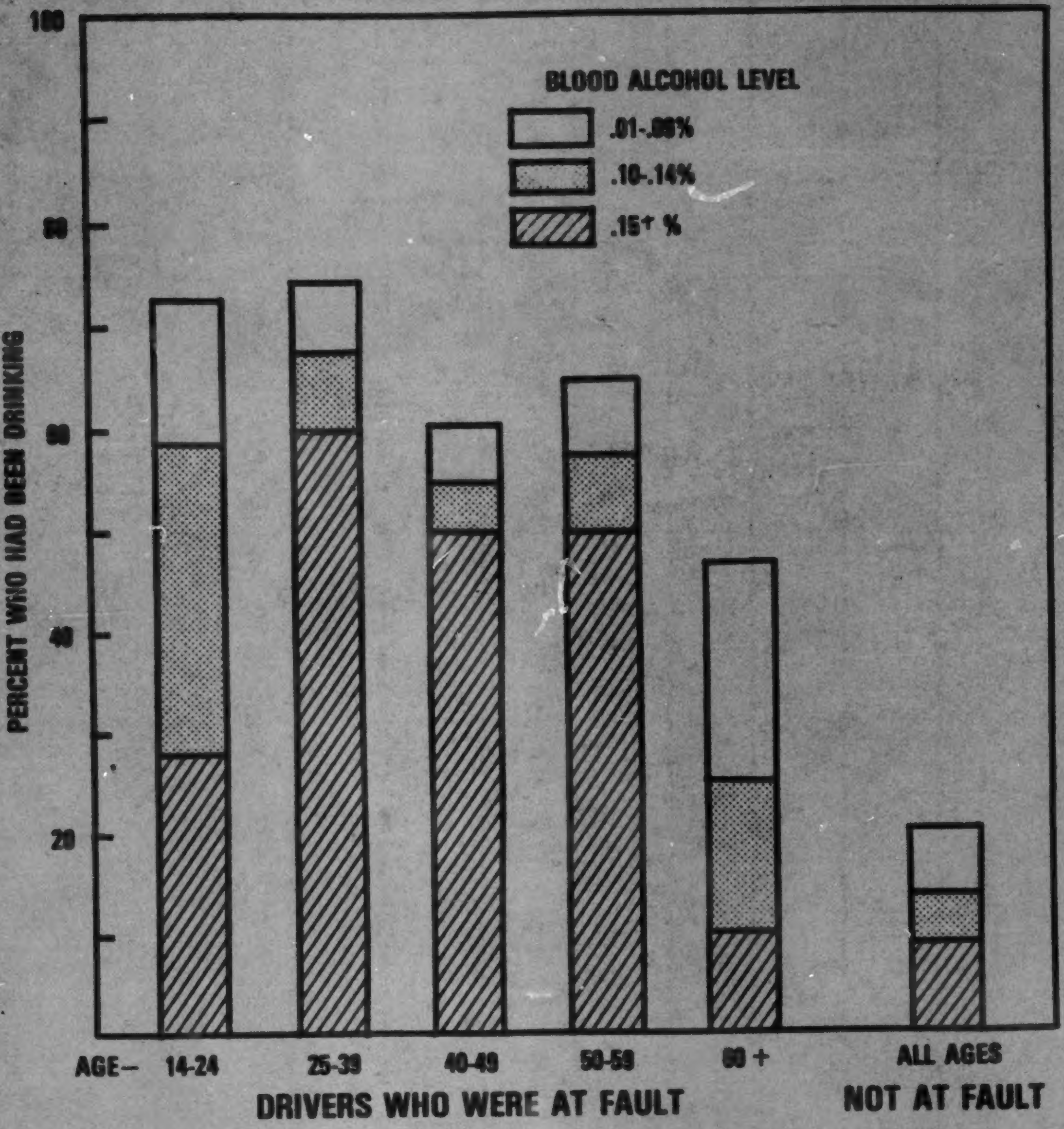
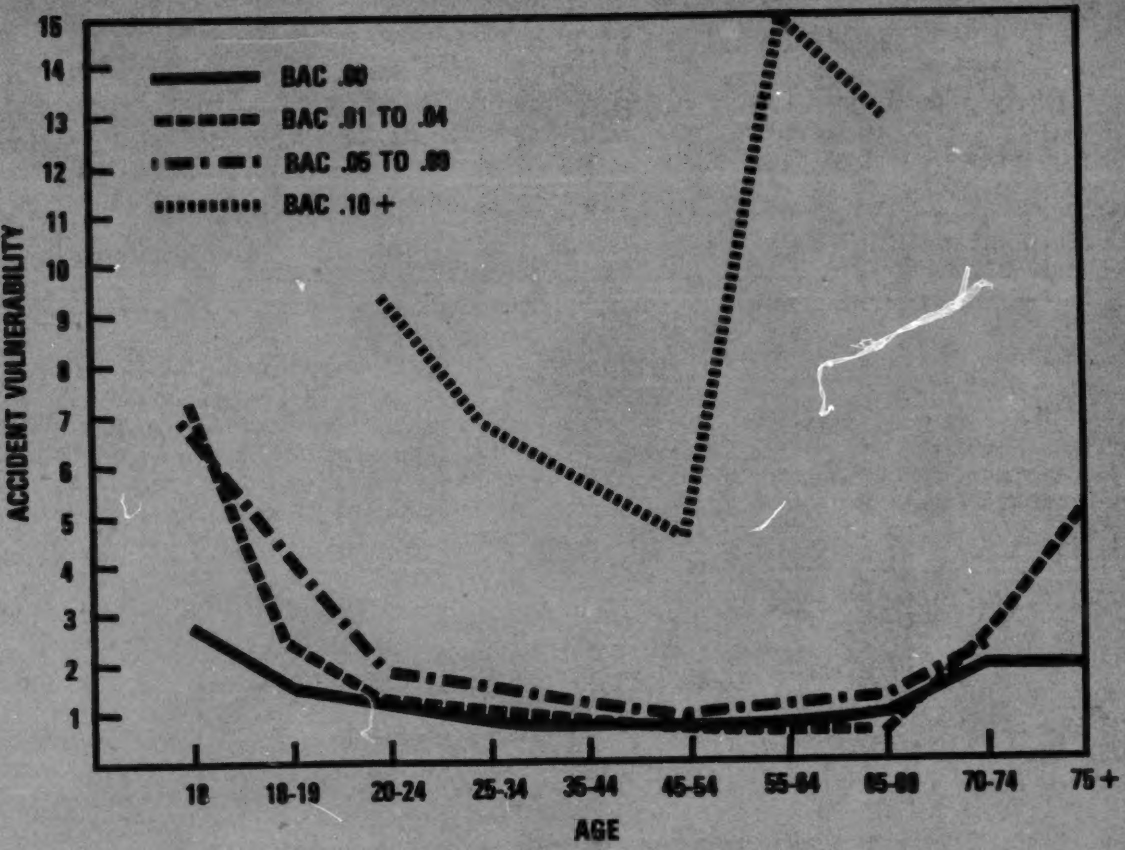


Source: Baker, S., Johns Hopkins, 1969

Figure 7

BLOOD ALCOHOL LEVEL IN FATALLY INJURED DRIVERS
AT FAULT AND NOT AT FAULT

behavior characteristic of many alcohol-related crashes is not known at present, but a positive relationship is apparent.



Source: Zylman: Quart. J. Stud. Alco. Suppl. No. 4, 1968

Figure 8

ACCIDENT VULNERABILITY AS A FUNCTION OF AGE AND BAC IN MEN*

Use of High-Risk Vehicles

One other area of general safety concern, which is more characteristic of young drivers than of their older counterparts, involves the use of high-risk vehicles such as motorcycles. The Goldstein review points out that the fatality rate for motorcycles is at least five times* as great as for automobiles, and motorcycling is predominantly a young male activity. More than half of the owners of motorcycles are under the age of 25, and approximately two-thirds of all motorcycle crashes (fatal and nonfatal) involve drivers under the age of 25.

One of the most significant aspects of this area of youth crash problems is the fact that with motorcycles the fatality rate is highest among those with the least experience. In fact, a significantly high percentage of motorcycle crashes occurs within the first 6 months of experience, with many crashes occurring on the first ride and often involving borrowed vehicles. Such information, of course, strongly suggests the need for formal motorcyclist training and stringent licensing requirements.

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*As is indicated on page 19, NHTSA estimates that the motorcycle death rate is more like 3.7 times the rate for automobiles.

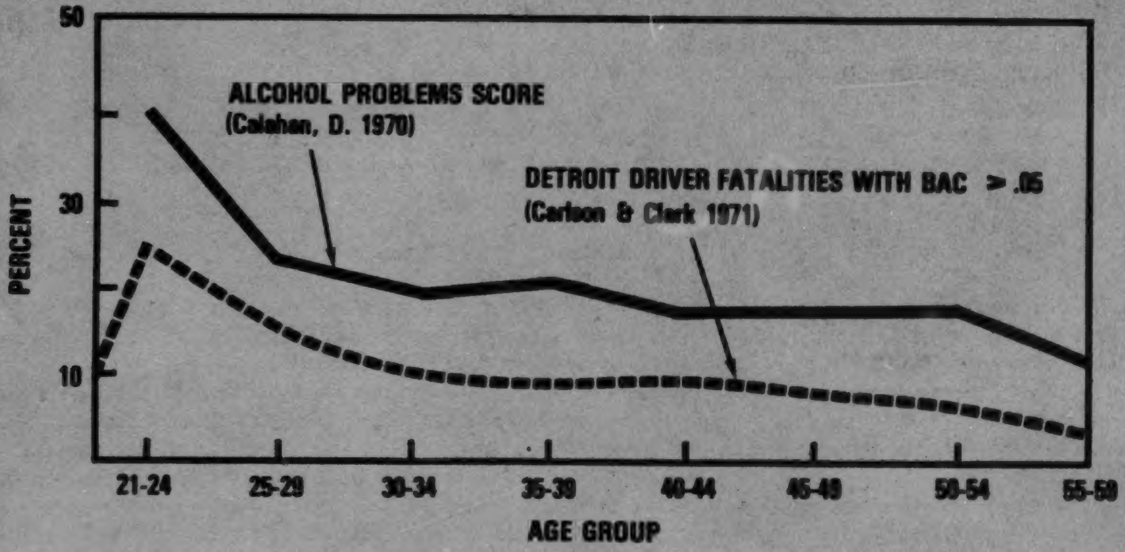
Personal Biographical Characteristics

Finally, in the personal biographical area, the Goldstein review (16) points out the emergence of a cluster of personal variables that appear to be related to crashes involving young male drivers. Citing research by Pelz and Schuman et al. (21), Goldstein lists anger, hostility, rebellion, argument, distraction, escape, and competitiveness as being among such personal traits. He points out that the overexpression of impulsiveness that characterizes young males more than any other driver group, and that includes daredevil driving, anger in traffic situations, driving to blow off steam after arguments, fist fights, and thoughts of injury while driving, also appears to be related to crashes and violations and is most characteristic of the 16-24 age group.

Citing a 1971 young driver study by Harrington (22), Goldstein demonstrates support for the contention that achieving, conforming, cooperative young drivers have less trouble on the highway than those who are troubled, rebellious, worried, upset, alienated, and so forth. Fortunately, there appears to be a lessening of this personal turbulence with increasing age. This aspect requires closer scrutiny because of its similarity to the problem drinking area. A study by Cahalan (23), for example, indicates that drinking problems are most frequent among persons under the age of 30, with a dramatic tapering off after this age. This relationship is shown in figure 9.

D. Elderly Drivers

As shown in table 1, elderly drivers (age 60 or above) account for approximately 13.8 percent of the Nation's licensed drivers, 18.3 percent of all crashes, and 11.5 percent of all fatal crashes. Thus, according to these figures they are overinvolved in all crashes by approximately 30 percent and underinvolved in fatalities by about 20 percent. At first glance, these statistics do not appear too significant. However, when one considers the fact that the elderly person drives very few miles,



Source: NHTSA (15)

Figure 9

DISTRIBUTION OF ALCOHOL-RELATED PROBLEMS AND ALCOHOL-RELATED CRASHES BY AGE GROUP it appears that the probability of crash involvement per mile driven may be as much as twice that of the middle-aged driver (6).

Interest in the aging driver is relatively new compared with past efforts to combat the driving problems of young drivers. One of the earlier studies in this area was conducted in 1960 by Marsh (24), who concluded that many of the elderly drivers' problems in traffic safety involve:

- Difficulties with headlight glare and other night-driving problems
- Reduced speed of perception, reaction time, and ability to react in complex or demanding circumstances
- Reduced ability to judge distances
- Lack of knowledge of rules of the road
- Possible preoccupation with other adjustment problems

Somewhat later, Planek (6) conducted a questionnaire survey of elderly drivers' problems. Some of his findings with regard to the problems of this age group include the following:

- The elderly driver does not always perceive his driving problems at their appropriate level of importance in relation to accident occurrence.
- The elderly driver's accident problems involve interactions with the traffic flow around him rather than his ability to maintain himself within the flow in his own lane. His chief problems in this respect appear to involve changing lanes, turning, passing, and backing.
- The elderly driver is likely to have problems in inattention, largely related to stimulus overload and the necessity for rapid reaction. Though he does not always perceive such problems as being important, he does recognize that he has some difficulty reading traffic signs. Major problems resulting from these factors appear to involve running red lights and stop signs.
- The elderly driver often feels that he drives too slowly. Yet he usually would like to drive even slower because he is then able to accommodate himself to the flow of traffic in his own lane.
- The elderly driver learned to drive quite a few years ago and he may never have taken a license exam. Consequently he may not be fully conscious of the various rules of the road and of proper driving techniques.

In addition to the foregoing, one problem that has surfaced in the literature only recently, and that is discussed more extensively in the young driver section, involves the effects of alcohol. It appears from the data that BAC's, even at low levels, result in a greater impairment effect for elderly drivers than for middle-aged drivers (14, 19).

E. Motorcycle Operators

One additional prime target group that overlaps considerably with the young driver target group, and that is discussed to some degree in the young driver section, involves the operation of motorcycles. Table 1 suggests that such operators constitute only about 3.3 percent of the Nation's licensed drivers and approximately 4.7 percent of the annual highway fatalities. While motorcyclists' crash involvement is small in terms of proportions, it is a significant problem in terms of the high rate of crashes, injuries, and deaths per mile driven. For example, the mileage-death rate for motorcycle riders during 1973 was estimated to be about 16 deaths per 100 million miles traveled, or approximately 3.7 times the rate for automobile occupants (1). A very important aspect of motorcycle crashes is the fact that a personal injury or death results from more than 80 percent of all *reported* motorcycle crashes. Furthermore, approximately one-third of such crashes occur in the first 6 months of experience. Another factor involves an extreme degree of underreporting of motorcycle crashes and the high number of offroad motorcycles and crashes involved.

Regarding the types of crashes involving motorcycles, it appears that the vast majority of serious and fatal motorcycle crashes involve collisions with automobiles. Only about one-third of the reported fatal motorcycle crashes involve running off the road, overturning, or hitting a fixed object, animal, or pedestrian (25). Interestingly enough, of the approximate two-thirds of fatal crashes that involve other motor vehicles, police reports indicate that in well over half the driver of the other motor vehicle is at fault. Most often the drivers of the other vehicles claim that they did not see the motorcyclist. How much this finding indicates a visibility problem or an attitude problem regarding an automobile driver's respect for the cyclist is still to be determined. Certainly it appears that a knowledge of defensive driving skills is a must for motorcycle operators.

F. Problem and Near-Problem Drivers

Although not generally included within the domain of driver education, another target group for traffic safety education efforts involves the driver who has already come to the attention of authorities because of traffic violations and crashes. Such persons are termed "problem" or "near-problem" drivers, and represent a continuum of severity ranging from the least severe (one prior violation or crash) to the most severe (five or more crashes). Table 5 provides some estimates regarding the proportions of licensed drivers and total crashes accounted for by various types of problem and near-problem drivers. Much educational effort has been directed to this target group in the past under the assumption that a small number of extreme problem drivers account for a large proportion of crashes. Table 5 indicates that this assumption is not accurate, especially when it is confined to the most severe problem drivers.

Table 5

ESTIMATES OF THE PROPORTION OF LICENSED DRIVERS AND TOTAL CRASHES ACCOUNTED FOR BY VARIOUS PROBLEM DRIVER TYPES

TARGET GROUP (DRIVERS WITH:)	PERCENT OF LICENSED DRIVERS	PERCENT OF TOTAL CRASHES
1 OR MORE VIOLATIONS (PAST 2 YRS)	32%	50%
2 OR MORE VIOLATIONS (PAST 2 YRS)	12%	25%
2 OR MORE CRASHES (PAST 4 YRS)	8%	9%
4 OR MORE VIOLATIONS (PAST 4 YRS)	5%	5%
5 OR MORE CRASHES (PAST 4 YRS)	< 1%	< 1%

Note: The above figures represent estimates based on an aggregate of research studies. The studies used to derive these figures can be found from references (90, 91, 92, 93). The estimates for the more severe problem driver types probably err on the high side if at all.

One additional point regarding problem driver groups is that there are three to four members of any one severity group for every member who will become involved in a *crash* in the subsequent year. Further, there are approximately 600 such targets for every 1 to become involved in a *fatal crash* in the next year. This point involves important implications for the number of persons who must be exposed to an *effective* program to have a significant impact on crashes.

G. Drinking Drivers

Drinking drivers constitute a problem driver group that is involved in more than 50 percent of all fatal highway crashes (26). Drinking driver involvement in less serious crashes is not specifically known because of the failure to test for alcohol in most nonfatal crashes. It is estimated that, although the proportion of nonfatal crashes involving drinking drivers is probably less than 50 percent, it is still substantial.

Studies of arrested drinking drivers have indicated that at least 50 percent of such persons can be classified as problem drinkers who are frequently on the roads at high BAC's. Some of the more common characteristics associated with drinking-driving crashes are excessive speed, driving in the wrong lane, inattention, and falling asleep. Such crashes are predominantly nighttime, single-vehicle crashes where the driver runs off the road, overturns, or strikes a fixed object. While motor skills are certainly affected by alcohol, it appears that some of the most important decrements resulting from the use of alcohol involve cognitive, perceptual, and emotional factors. As discussed in the section on young drivers, alcohol appears to have the greatest impairment effect on young and elderly drivers.

H. All Drivers

Certainly the target group accounting for the greatest proportion of fatal and other highway crashes involves all 122,400,000 licensed drivers. Many of the current "advanced" or "adult" educational programs are aimed at this general target group.

Table 6 provides a listing of three primary types of crashes (according to the presence or absence of other vehicles) in which drivers are involved, and the proportion of crashes accounted for by each crash type. It is apparent that crashes involving more than one vehicle account for more than 75 percent of *all* crashes and only about 40 percent of *fatal* crashes (still more than single-vehicle or pedestrian crashes). Single-vehicle and pedestrian crashes have a significantly greater contribution to the *fatal* crash picture. Single-vehicle crashes (fatal or nonfatal) are predominantly a rural phenomenon, and pedestrian crashes (fatal or nonfatal) occur primarily in urban areas. While fatal multiple-vehicle crashes are usually rural crashes, the majority of all crashes involving more than one vehicle occur in urban areas.

As Table 7 shows, nighttime crashes account for only a slightly greater percentage of fatal crashes. In terms of deaths per miles driven, however, the nighttime fatality rate is two to three times as great as the daytime rate. Thus, nighttime driving may be two to three times more hazardous than daytime driving. This issue becomes important in later discussions of the different driving habits of persons who volunteer for driver education and of those who do not.

Finally, table 8 provides some estimates of the proportions of fatal injury and total crashes that involve various types of improper driving actions. The National Safety Council (NSC) (1), which provides the source for tables 6, 7, and 8, clearly points out that most crashes involve multiple causative factors involving various combinations of environmental, vehicle, and driver components. The NSC also suggests, however, that correcting the improper driving practices, which are so frequently involved in crash causation, could have an important effect in reducing the probability of

Table 6

SUMMARY OF PROPORTIONS* OF CRASHES ACCOUNTED FOR BY VARIOUS CRASH TYPES

TYPE OF CRASH	ALL CRASHES	FATAL CRASHES
• MULTIPLE VEHICLE	78% U	41% R
INTERSECTION	(37%)	(16%)
NON-INTERSECTION	(42%)	(24%)
• SINGLE VEHICLE	20% R	39% R
COLLISION	(16%) U	(28%) U/R
NON-COLLISION	(5%) R	(14%) R
• PEDESTRIAN	2% U	20% U
INTERSECTION	(1%)	(6%)
NON-INTERSECTION	(1%)	(13%)
	R – PREDOMINANTLY RURAL CRASHES U – PREDOMINANTLY URBAN CRASHES	

*All numbers are rounded to nearest whole percent.

Source: National Safety Council
Accident Facts, 1974

crash occurrences. This suggestion is an obvious reference to the potential for traffic safety education and training programs for preventing crashes. Such programs and their potential are the subject matter of the remainder of this report.

Table 7

FATALITIES AND FATALITY RATES BY DAY AND NIGHT

CRASHES	TIME	% FATALITIES	FATALITY RATE*
TOTAL	DAY	48%	2.9
	NIGHT	52%	7.4
URBAN	DAY	47%	1.8
	NIGHT	53%	4.6
RURAL	DAY	48%	4.3
	NIGHT	52%	10.7

*Deaths per 100 million miles traveled

Source: National Safety Council Accident Facts 1974

Table 8

PROPORTION OF CRASHES INVOLVING VARIOUS TYPES OF IMPROPER DRIVING

TYPE OF DRIVING	TYPE OF CRASH		
	FATAL	INJURY	ALL
IMPROPER DRIVING	67%	73%	80%
SPEED TOO FAST	25%	18%	13%
RIGHT OF WAY	14%	21%	20%
LEFT OF CENTER	12%	4%	3%
OVERTAKING	2%	2%	3%
IMPROPER TURN	1%	2%	4%
FOLLOW TOO CLOSE	1%	9%	12%
OTHER	13%	18%	25%
NO IMPROPER DRIVING	33%	27%	20%

Source: National Safety Council
Accident Facts (1)

Section Four

A HISTORICAL VIEW OF HIGH SCHOOL DRIVER EDUCATION IN THE UNITED STATES

A. Introduction

Basically, the idea of training persons to operate motor vehicles stems from the assumption that trained or experienced persons will perform better in most traffic situations than untrained or inexperienced people. The beginning of driver and safety education was based primarily on this assumption, and most programs were implemented on the basis of their face validity for accident prevention. In addition to the commonsense emphasis placed on the skills required for driving, a similar emphasis was placed on the development of assumed safe-driving attitudes, with the belief that such attitudes would result in fewer crashes *and* that such attitudes could be manipulated or developed.

Unfortunately, it was not until very recently that an attempt has been made to determine scientifically which behavioral variables (including attitudes and skills) have a causal relationship with crashes. Recent efforts have also sought to determine whether such variables can be manipulated or developed by means of effective training. Measurement of the extent to which a curriculum meets such instructional objectives and various performance requirements has also been emphasized recently. Furthermore, serious attempts are now being made to assess the degree to which such programs are successful in meeting their ultimate goal of crash prevention.

B. A Chronological Summary of the History of HSDE

In order to provide a perspective of the history of event that marked the evolution of the High School Driver Education (HSDE) movement, the following chronological summary of events has been prepared, primarily from information presented in a 1971 study by Warner (31).

*1913	The National Safety Council (NSC) is formed.
1916	The first known driver education program is developed by William Fulton in Gilbert, Minnesota.
1919	The first textbook for safety education is authored by Dr. E. George Payne, Harris Teachers College, St. Louis, Missouri.
*1922	The Safety Education Section of NSC is formed by Albert W. Whitney.
*1924	National Highway Safety Conferences are held because of mounting highway death toll.
1929	The first general safety education course at a teacher-training institution is developed at Columbia University by Dr. Herbert J. Stack.
1930	Dr. Amos Neyhart (the "father of driver education") begins teaching high school students behind the wheel (BTW) on a voluntary basis.
1932	The first classroom driver education course is offered in Westwood, New Jersey, by Dr. Herbert J. Stack.
1934	The first separate classroom and laboratory phases are offered by Amos Neyhart at Pennsylvania State College.

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*Denotes important organizational events.

1930	The first driving simulator and the first automobile-driving range are developed by Dr. A. R. Lauer at Ohio State University and later at Iowa State College.
1934	The NSC provides first film entitled *Ask Daddy*.
1936	The first high school driver education textbook *Man and the Motor Car* is edited by Albert Whitney.
1936	The first three-phase program (classroom, simulation, and BTW) is implemented at Lane Tech, Chicago, Illinois, by William A. Sears.
1936	Amos Neyhart becomes traveling consultant for American Automobile Association (AAA).
1937	The first citywide driver education program is implemented in Cleveland, Ohio, by Leslie R. Silvernale.
1938	Campus centers for teaching undergraduate and graduate courses in driver education are initiated at Penn State under Amos Neyhart and at New York University under Herbert Stack.
1938	The AAA textbook *Sportsmanlike Driving* is published.
1941	The first comprehensive study of the effectiveness of driver education is published, Cleveland, Ohio.
*1942	Wartime driver preparation programs are implemented.
*1943	The National Commission on Safety Education (NCSE) is established as part of the National Education Association (NEA). The Automotive Safety Foundation (ASF) provides first grant to the NCSE.
*1945	The first President's Conference for Highway Safety is held.
1945	Most driver education teachers are being prepared either at Penn State or New York University.
*1949	The NCSE conducts the first National Conference on High School Driver Education in Jacksons Mill, West Virginia.
*1952	The Allstate Insurance initiates policy of providing insurance reductions for students completing HSDE.
*1953	The second National Conference on High School Driver Education is held in East Lansing, Michigan.
*1954	The second President's Conference for Highway Safety is held.
1954	The first college textbook on driver education, entitled *Highway and Driver Education*, is published.
1955-56	Safety centers are established at the University of Maryland and at Michigan State University.
*1956	The American Driver and Traffic Safety Education Association is organized.
1957	The use of video tapes for classroom courses begins in Cincinnati, Ohio.
*1958	The third National Conference on High School Driver Education is held in La Fayette, Indiana.

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*Denotes important organizational events.

1960	Numerous HSDE "effectiveness" studies are conducted and reported.
*1963	The fourth National Conference on High School Driver Education is held in Washington, D.C.
1964	Wisconsin employs educational television to teach driver education statewide.
1964	The NSC develops an 8-hour classroom program called the "Defensive Driving Course."
1965	There are nearly 400 multiple-car ranges and 14 safety centers in the United States.
*1966	Congress enacts the Highway Safety Act of 1966, which ultimately leads to the creation of the National Highway Safety Bureau (NHSB) and highway safety standards, and the use of matching Federal funds to encourage highway safety programs such as driver education.
*1967	The *Driver Education Standard* is implemented.
1968-69	Moynihan and McGuire reports criticize HSDE.
*1970	The Federal-Aid Highway Act of 1970 and the Highway Safety Act of 1970 are enacted. The NHSB becomes the National Highway Traffic Safety Administration (NHTSA).
*1970	The Highway Users Federation for Safety and Mobility is formed by a staff merger of ASF, the National Highway Users Conference, and the Automobile Industries Highway Safety Committee.
*1970	The NCSE is discontinued by NEA.
1971	Driver Education Task Analysis and instructional objectives are completed.
*1973	The Fifth National Conference on Safety Education is held in Warrensburg, Missouri.
1973	The Federal-Aid Highway Safety Act of 1973 calls for Driver Education Evaluation Study.

C. Phases of HSDE

This series of events can be characterized in a variety of ways, depending on the point of view and involvement in the HSDE effort. Following is a proposed phasing system:

Phase I: Certainly the era before 1949 reflects a period of relatively disorganized and uncontrolled development efforts, without much emphasis being placed on program content, quality control, or evaluation. During this and the subsequent period, considerably exaggerated claims were made concerning the potential effectiveness of HSDE in reducing crashes and violations.

Phase II: Starting with the creation of the NCSE of the NEA in 1943, and continuing through the 20 years in which NCSE sponsored the four National Conferences on High School Driver Education (1949, 1953, 1958, and 1963), several initial attempts to improve the quality control of HSDE (i.e., teacher preparation, course standardization, etc.) are apparent. However, little evidence of objective curriculum *development* or *evaluation* efforts can be found in this period. A number of large-scale uncontrolled evaluations were conducted during the last decade of this era, and were to become the target critical studies in the 1960's. One additional significant event which occurred during this period involves the initiation in 1952 of the insurance industry policy of providing premium reductions for newly licensed drivers who had completed a driver education course.

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*Denotes important organizational events.

Phase III: Overlapping somewhat with the previous period and extending to the present is what can be called the "critical period" for HSDE. Beginning with studies by independent researchers in the early 1960's and continuing with the Moynihan (32) and McGuire and Kersh (33) reports in 1968, HSDE came under severe attack with regard to its claimed effectiveness in crash prevention. This era is more completely described in the HSDE "effectiveness" section of this report. Whether any substantial changes were made during the 1960's as a result of such criticism is a matter of opinion. Kaywood (34) has suggested that for the most part "these voices went unheeded." During this period, HSDE was expanded from providing training for approximately 1 million students to providing training for more than 2 million students.

Phase IV: Although criticism of HSDE remains substantial in the 1970's, as is evident from the findings of the California Driver Training Evaluation Study (36), several significant events have taken place in this period that suggest that perhaps they will mark the beginning of a new era of accountability (37, 38, 39, 40, 41), objective curriculum development (42, 43, 44, 45, 46), and adequate evaluation by the HSDE community (45, 47, 48). One additional event of the early 1970's involves the convening of the Fifth National Conference for Traffic Safety Education in December of 1973. After this conference, it was apparent that four primary thrusts were underway in the traffic safety education area (49), as follows:

- *Qualitative* improvement was being emphasized above the need for quantitative expansion.
- HSDE was becoming an integrated component of a much larger *traffic safety* education program for various driver groups.
- Increasing emphasis was being placed on cost-effective safety education with built-in evaluation based on *measurable objectives.*
- Instructional management was moving more toward *criterion-referenced* courses for students as opposed to time-based instruction.

D. National and Federal Events in the History of HSDE

In order to understand the role of the Federal Government in the history of HSDE development, it would be useful to point out some of the initial non-Federal efforts to improve and standardize the quality of such programs. From the literature available, it appears that one of the most important organizations in this regard was the NCSE of the NEA, established in 1943. One of the primary roles of this commission involved its support of four national conferences that developed guidelines and minimum requirements for HSDE programs and teacher preparation. Unfortunately, the commission did not have the means to enforce such guidelines or recommendations.

With the advent of the Highway Safety Act of 1966 (P.L. 89-564), matching funds (sec. 402) were made available to the States to implement their highway safety programs, and additional funds (sec. 403) were made available for Federal research and development projects. Thus, with this act, some leverage was provided for the enforcement of at least some of the guidelines developed in the prior national (and special) conferences by making the availability of section 402 funds contingent upon progress in meeting such requirements. The areas of interest were spelled out in the five basic elements of the *Driver Education Standard* issued on June 27, 1967. These five basic areas of interest included:

- Providing for the availability of a driver education program to all youths of licensing age
- Providing for a State research and development program
- Providing for a program for adult driver training and retraining
- Providing for the licensing of commercial driver education schools and the certification of their instructors
- Providing periodic evaluation of the State program by the State and the Federal Government

The prime function of the Driver Education Programs Division of NHSB (now NHTSA), which was established as a result of the 1966 act, became one of providing the States and their political subdivisions with technical and financial assistance to meet the requirements of the standard. However, the goal of expanding the State programs to all eligible students was the primary thrust taken by the States in response to this standard, and most of the funds provided by section 402 were in response to this goal.

Using funds provided for under section 403 of the 1966 act, however, NHTSA quickly embarked on a comprehensive development and evaluation plan, which is described fully in sections seven and eight of this report. As a result of section 226 of the Federal-Aid Highway Act of 1973, and its requirement to conduct and report to Congress an evaluation of various types of driver education programs, this ongoing program (initiated under the authority of sec. 403 of the 1966 Highway Safety Act) became the nucleus of the Driver Education Evaluation Program, as well as a major influence in the driver education community. Since none of the $10 million authorized for this evaluation activity was actually appropriated, the ongoing research and development plan was not appreciably expanded or changed.

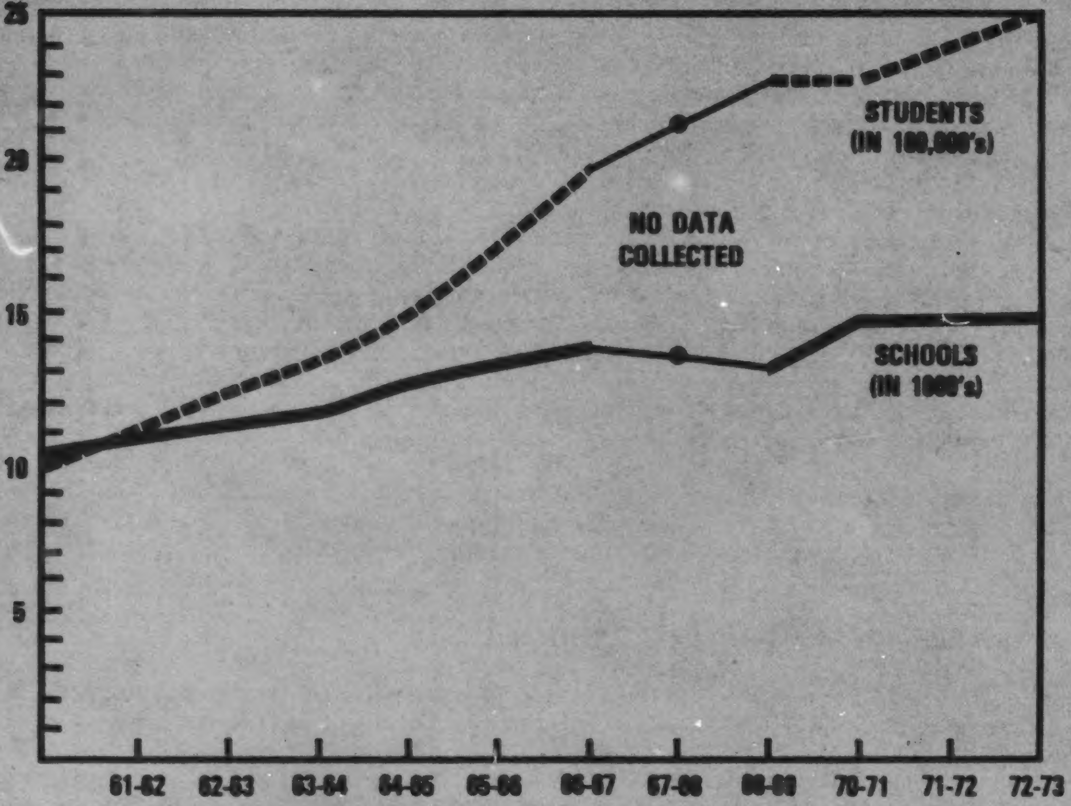
Two additional events should be pointed out in this discussion of national involvement in the history of driver education efforts. These include the establishment of the Department of Transportation and NHTSA by Congress in 1970, and the discontinuation of NEA's NCSE in that same year.

E. Status of the Implementation of HSDE Programs

As of the 1972-73 school year, 3,591,137 students were considered eligible to enroll in HSDE. Of that number, 2,621,684, or 73 percent, chose to do so. This figure represents a 6.5-percent increase over the previous year (35). Figure 10 shows the trend in student enrollment and its relationship to the number of schools offering HSDE since 1961. As is apparent from this figure, student enrollment has increased from approximately 1,100,000 to 2,621,684 in the decade from the 1962-63 school year to the 1972-73 school year. This increase represents an overall increase of 138 percent, or an average increase of 150,000 students per year.

As figure 11 indicates, of the 2.6 million students taught in HSDE in 1972-73, 95 percent received classroom training, 79 percent received BTW training, 21 percent received simulator training, and 10 percent received offstreet range training (35).

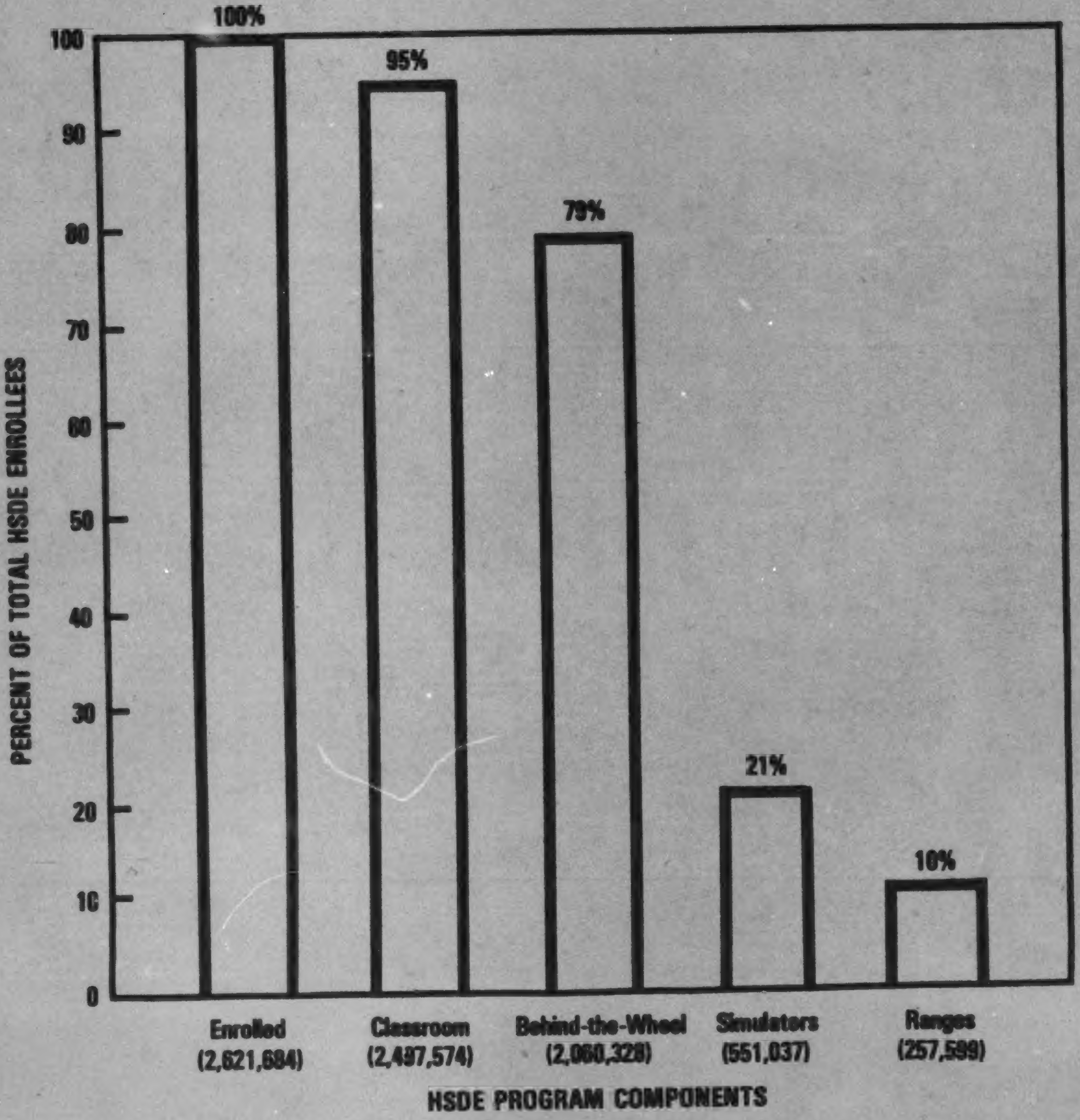
With regard to financing, NSC figures indicate that in 1972-73, 43 States received Federal funds authorized by section 402 of the 1966 act for their HSDE programs. Thirty-one States received State reimbursements. While the maximum allowable reimbursement per pupil was $41.37, the average cost of instruction per pupil came to $76.32.



Source: National Safety Council (35)
Driver Education Status Report 1972-73

Figure 10

NUMBER OF STUDENTS ENROLLED IN HSDE AND NUMBER OF SCHOOLS OFFERING HSDE FROM SCHOOL YEAR 1961-62 TO SCHOOL YEAR 1972-73



Source: National Safety Council (35)
Driver Education Status Report 1972-73

Figure 11

PROPORTION OF STUDENTS ENROLLED IN VARIOUS TYPES OF HSDE PROGRAM COMPONENTS IN 1972-73 SCHOOL YEAR

Section Five

STUDIES OF THE EFFECTIVENESS OF HIGH SCHOOL DRIVER EDUCATION PROGRAMS

A. Introduction

There can be little doubt that High School Driver Education (HSDE) provides a training function for society, in that it is the primary means by which approximately 73 percent of newly licensed drivers gain the knowledge and skills necessary to attain their driving licenses. Undoubtedly this program constitutes a considerable service to the parents of teenagers who are of licensing age. The question with which HSDE effectiveness studies are concerned, however, involves whether young drivers who obtain driving licenses primarily by means of HSDE training have better crash records after licensing than do *the same types* of young drivers who are trained by some means other than a formal HSDE course (e.g., parent training). Here there is considerable skepticism, and the following review is intended to summarize what kinds of studies have been conducted in the past, what the major findings have been, and what research deficiencies have characterized this area. No attempt has been made to review or critique all the studies. Rather, an attempt has been made to convey accurately the overall status and meaning of this body of research. Most of the studies reviewed occurred before the emergence of the National Highway Traffic Safety Administration (NHTSA) and its Driver Education Evaluation Program (DEEP). Some of the studies, however, have been implemented in the States since 1968 when NHTSA (then the National Highway Safety Bureau) embarked on its long-term research, development, and evaluation program in the driver education area. The NHTSA efforts that constitute DEEP are reported in sections seven and eight.

B. Early Studies by Proponents of HSDE

A number of studies were conducted in the 1950's and early 1960's purportedly to determine the effectiveness of HSDE. Most of these studies, however, were apparently conducted by proponents of the programs, and appear to have been conducted more for the purpose of supporting the researchers' convictions (that HSDE was effective in preventing crashes) than for the purpose of objectively determining whether HSDE was effective. The situation is similar to that described in a recent paper by Campbell (50) concerning "trapped administrators." The majority of these studies have already been reviewed by the American Automobile Association (51), the Association of Casualty and Surety Companies (52), Goldstein (53, 54), the National Commission on Safety Education (55), and the National Transportation Safety Board (15). To summarize the findings of the rather large number of these studies, a few of the larger scale efforts have been selected for description, for example:

- A 5-year study conducted in Minnesota from 1950 through 1954 compared the driving records of 3,000 drivers in three groups: a) drivers without a formal course in driver education; b) drivers who have taken a classroom HSDE course; and c) drivers who received behind-the-wheel (BTW) training in addition to classroom training. The results suggested that the complete course was more effective than either the classroom-only course or no training (56).
- In conjunction with Michigan State University, the city of Lansing, Michigan, released a study in 1962 that indicated that, in spite of National Safety Council estimates that young beginning drivers have twice as many crashes per driver as older drivers, HSDE graduates in that city had 20 percent fewer crashes than did older drivers (57).
- In 1964, the Connecticut Motor Vehicle Department released a study of the driving records of nearly 50,000 young beginning drivers. The results indicated that HSDE students had 40 percent fewer violations than parent-trained drivers, and 45 percent fewer violations than commercially trained drivers (59).

- In a somewhat more controlled study, the New York Motor Vehicle Department released a study in 1964 which involved 960 HSDE-trained students and 960 nontrained students matched on variables such as academic status, sex, and school attended. The driving records of these two groups were followed and compared for approximately 18 months, and it was reported that untrained students had 22 percent more crashes than the HSDE-trained students (60).

While there were several additional large-scale studies conducted during the 1950's and early 1960's, a few of which even showed *non*-HSDE-trained students to have *better* subsequent driving records than HSDE-trained students (51), most of such studies can be characterized as follows:

- Most were conducted to support the conclusion that HSDE was effective, rather than to document objectively such effectiveness.
- All were post hoc driver record examinations that did *not* involve preassigning persons to various groups in a random or unbiased fashion, and then following the records of such preassigned groups.
- Few attempted to control for the effects of extraneous variables known to be significantly related to crashes (e.g., socioeconomic status, sex, driving exposure.
- The conclusions of these studies were generally that
  - HSDE graduates have 50 percent fewer crashes than nongraduates.
  - Complete courses involving on-the-road training are more effective than classroom-only courses.
  - HSDE is more effective than either parent or commercial training.

C. Studies by Independent Researchers

It was not long before the research inadequacies of studies like those already mentioned were being brought to public view. The failure to assign students randomly to HSDE and non-HSDE conditions *before* comparing their subsequent records, the failure to control for important extraneous variables, and the failure of earlier studies to report the specific characteristics of the driver education curricula being evaluated were soon pointed out by a number of less convinced researchers.

For example, studies conducted by Conger, Miller, and Rainey in 1966 (65) and by Ferdun, Peck, and Coppin in 1967 (66) suggested that the types of students who enrolled in HSDE drove significantly fewer miles than did those who did not enroll in HSDE. Thus, the probability of crash involvement for the HSDE group was less than for the non-HSDE group even before the training had begun. This example is one of a contaminating effect resulting from differential *quantitative* exposure. There are some indications in the literature that students who enroll in HSDE differ from nonenrollees with regard to *qualitative* exposure as well. That is, they drive less frequently at high-risk times (e.g., at night) than do their non-HSDE counterparts.

An earlier study by Rainey, Conger, and Walsmith in 1961 (67) suggested that HSDE and non-HSDE students also differed on various personality factors, in that HSDE enrollees were significantly more introspective, sensitive, and esthetic in their interests. A later study conducted by Asher in 1968 (68) appeared to confirm personality-related differences centering around academic knowledge, intelligence, and socioeconomic status–all seemingly related to crashes.

One result of these kinds of research findings was the suggestion that if the effects of these extraneous variables were removed, or controlled for, it might be that HSDE students would not have significantly fewer crashes (due to HSDE training) than young drivers who did not enroll in HSDE.

One study conducted in 1966 (65) appeared to lend some evidence to such a proposition. This study also did not involve randomly assigned comparison groups but, rather, compared a) persons who desired and took HSED, b) those who desired but did not take HSDE, and c) those who did not desire and did not take HSDE. Generally, few differences in subsequent crash involvement between such groups could be documented, and it was suggested, at least, that as more of the effects of such variables could be accounted for, fewer crash reduction effects attributable to HSDE training would be apparent. These results were similar to those reported by Coppin et al. (69).

Perhaps the most dramatic assertion of the lack of documented effectiveness of HSDE was made in 1969 by McGuire and Kersh in a critical review of the research literature (33). This study concluded that HSDE, as it existed at that time, bore *no* causal relationship to either traffic violations or crash frequency. This study probably represents one of the most extreme of the criticisms directed at HSDE to date. While this study was also attacked for its methodological shortcomings (34), it was becoming more and more apparent in the literature that:

- An HSDE course needed to be developed based on critical driving tasks, using curriculum objectives related to these tasks, and evaluated by means of immediate performance goals as well as long-term crash involvement.
- Such a program needed to be evaluated using random assignment, experimental design procedures, and a long-term followup period to monitor the subsequent crash records of HSDE and non-HSDE drivers.

It was at about this time (1968) that NHTSA (then called the National Highway Safety Bureau) embarked on a research and development program to accomplish the foregoing objectives. However, in the course of the 5-6 years since the initiation of that research and development effort, several additional studies have been conducted in the States that warrant consideration.

D. Studies Conducted Since the 1968 Implementation of the NHTSA Research and Development Program

Several studies have been conducted that reflect the findings of a 1973 Ohio study (72), that HSDE can significantly improve *knowledge* levels and *attitudes* conducive to safe driving. In this particular study, HSDE students were given pre- and post-HSDE knowledge and attitude tests, and the results obtained were consistently in favor of positive changes in these measures—at least for short time intervals.

The California *Young Driver Follow Up Study* reported by Harrington in 1971 (22) and previously mentioned in the section dealing with the driving records of young drivers (sec. three), also involved a sophisticated attempt to determine the effects of HSDE training by statistically controlling for the effects of extraneous variables by means of analyses of covariance. The data, collected on a large number of young drivers, both male and female, suggested that driver training reduced fatal, injury, partially at-fault, and single-vehicle crashes for young female drivers. For young male drivers the evidence was less firm.

In this study biographical, attitudinal, personality, and driving-behavior data were collected on 13,915 young beginning drivers aged 16-17. Some of the more important findings were that:

- Those taking BTW driver education had better subsequent driving records than those not taking BTW training, but BTW students also appeared to have more socially desirable personality traits, thus confounding the results.
- Taking the foregoing differences into account, in-car instruction appeared to reduce the probability of fatal and injury crashes among young females, but not among young males.
- Analysis of the classroom phase of the program appeared to provide similar but less clear results.
- A cost-benefit analysis indicated that even though the apparent crash reduction was small, the savings at least equaled the cost of the program.

While this study did not involve random preassignment to training and nontraining groups, the analysis of covariance approach used represents perhaps the closest approximation to an adequately controlled study available to that date. Still, the author emphasizes the limitations of his methods, and suggests that any future studies in this area employ the randomized-groups experimental design. Such a suggestion is found in a variety of publications in this area since the mid-1960's (16, 22, 33).

A second California study, reported by Jones in 1973 (36), was conducted to compare benefits and costs of BTW driver training given by certified public high school teachers with that given by commercial driving-school instructors. All of the students in the study had completed or were enrolled in the classroom phase of the secondary school driver education program. The study also compared the standard 6-hour BTW training (or its simulator-assisted substitute) with programs providing up to 10 hours of BTW training. The results were as follows:

- In general, no significant differences were found between the groups trained by public school instructors and commercial instructors in terms of citations on the drivers' subsequent driving records. Also, there were no significant differences in the rate of reported accidents between short and long programs (public or commercial).
- Costs were found to vary widely among school districts and among commercial schools. However, based on a median category cost model developed to reduce the influence of the extremes in any category, the commercial training programs were found to be less expensive per student than were the public training programs.

There are some important restrictions on the applicability of the findings of this study, both within California and in other States. To begin with, there was no attempt to insure uniform curriculum content or teaching techniques for students in the various comparison groups. Also, there is not sufficient information reported in the study to determine whether any particular BTW program is similar to any or all of the other programs to which the students were exposed in the study. Finally, all commercial school instructors in the study had completed a special 41-hour driving-instructor's course. Therefore, the findings would not apply to programs in which the commercial instructors had not been so trained.

Since the release of the 1973 Jones report, the study has been reviewed by other researchers in the field. One particularly comprehensive review was recently completed by Goldstein (73).

Although the Goldstein report is extremely comprehensive and detailed, it appears reasonable to summarize it by stating that Goldstein disagrees with the conclusions of the Jones report, at least with regard to the differential effect of public and commercial training on young male drivers. Goldstein reports consistently more favorable results for the various *public* programs than for the *commercial* programs.

For example, Goldstein reports that *public short courses* (6 hours) do better than *commercial short courses* for male drivers, and that *public long courses* (10 hours) do better than *commercial long courses* for these same drivers.

The results for young female drivers were much less consistent, sometimes favoring the commercial and sometimes favoring the public courses. However, the *commercial* nonsimulator short courses appeared to be clearly superior to the *public* nonsimulator short courses in terms of subsequent speed violations among female drivers.

Generally, according to the Goldstein review, long courses did not fare any better than short courses (commercial or private). Also, there were no clear advantages to the use of simulators. Goldstein comments at the end of the report that simulator costs are so far out of line (high) that their use should be examined, particularly since the rationale for the use of simulators is that they can *reduce* instructional costs.

Several additional studies of State HSDE programs have recently been completed in Texas (74) and Iowa (75). The results of the Texas study were available at the time of this review and are described below.

The Texas study was designed to evaluate the major types of driver education taught in the public school systems in Texas, including various two-phase (classroom and on-the-road), three-phase (classroom, simulation, and on-the-road), and four-phase (classroom, simulation, range, and on-the-road) programs. In addition, programs that used educational television (ETV) for the classroom phase of their program were evaluated.

Although a retrospective evaluation design was used (rather than a random-preassignment experimental design), program effectiveness *was* measured in terms of crash and violation experience and students *were* matched on variables such as sex, father's occupation, cultural heritage, and grade average. One factor that could not be controlled for was age, because HSDE students are allowed to obtain driving licenses at age 16 in Texas and untrained students must wait until age 18. Thus there was a 10.6-month age difference between HSDE students and those who learned to drive by other means. The authors point out that "this could be a significant factor influencing comparisons of driving records between these two groups." The results of the study, however, suggested that:

- When moving violations (especially speeding) were compared between matched pairs, ETV subjects had significantly lower violation rates.
- There were no significant differences between the ETV group and the matched no-formal-treatment group with regard to crash rates.
- Trends were established that indicated that the three-phase, four-phase, and ETV programs were more potentially effective than was the two-phase program (in terms of overall crash and violations records).

Other interesting findings of the study include the following:

- Driver education subjects drove *more* in terms of annual mileage than nontrained subjects.
- Males drove four times as much as females.
- Males accounted for the major proportion of crashes and violations.

Other variables, such as quality of instruction, teacher preparation, and the usefulness of performance measures and diagnostic tests in differentiating between safe drivers and chronic violators, were also investigated. Basically the results of these analyses were that:

- The students of instructors who completed college majors other than physical education had better performance scores.
- The students of instructors who had more credit hours in driver education did better than those who had less prepared instructors.
- Students of instructors whose preparation had included physics had better records than students of instructors whose training had not included physics.
- Investigations of the scores on the McGuire Safe Driving Scale, scores on the Siebrecht-Attitude Scale, and license examination scores in conjunction with driving records indicated that there is enough support for a diagnostic pretest effort to warrant further investigation.

The Iowa study (75) attempted to assess the comparative effectiveness of various driver education programs in the public school system using matching techniques (instead of random-assignment, control-group techniques) and driver record followups. At the time of this review the 2-year followup of traffic records had not been completed.

Section Six

ISSUES AND ACTIVITIES IN HIGH SCHOOL AND OTHER DRIVER EDUCATION AREAS

A. Evaluation Issues

Problems in the Development of HSDE

As is apparent from the previous sections, one of the most pervading issues in the area of driver education is whether such programs reduce the crash involvement probability of persons exposed to them. A glance at the history of HSDE suggests that much of the present lack of documented effectiveness results from premature attempts to promote High School Driver Education (HSDE), based on its face validity, and to expand it to all eligible students without equal emphasis on evaluating and subsequently improving such programs.

As figure 12 illustrates, proper program development requires a series of *iterations* of 1) component development, 2) limited systematic program implementation, and 3) evaluation of program effects, before large-scale program implementation should be attempted. It is reasonably obvious that such an iterative developmental phase was virtually bypassed in the early decades of HSDE. In fact, it was not until 1968 that an attempt was made to initiate an adequate program development and evaluation plan. By that time, however, more than 2 million students, or about 54 percent of the total eligible population, were already being enrolled in HSDE each year at a considerable annual cost to the taxpayer.*

That a large number of persons were and are being exposed to a program of questionable effectiveness (and at a substantial cost to the public) is not the only issue involved, however. It is even more significant that HSDE was so completely accepted by the general public as an unquestionably effective program that it soon became difficult, if not impossible, to find a location where an adequate evaluation of HSDE could take place at an acceptable implementation cost. A proper explanation would benefit first from a more complete description of the evaluation requirements so frequently voiced in previous sections.

Requirements for Evaluating HSDE

It is apparent that one of the primary problems involved in interpreting the results of early HSDE effectiveness studies is the differences in kinds of persons who apparently volunteer for HSDE from those who do not. Thus, it has been questioned whether any observed crash involvement differences between HSDE and non-HSDE groups result from such training or from the personal differences that already exist between the two groups before training. The only acceptable way of controlling for this confounding relationship (see fig. 13) is as follows:

- Select a population or "pool" of potential HSDE students.
- Randomly assign these HSDE candidates into one of two possible groups including:
  - an *HSDE* group that would be exposed to formal HSDE training
  - a *non-HSDE* "control" group that would not be exposed to formal HSDE training
- Follow the driving records of both groups for a sufficient period of time (i.e., 2-3 years) to document any significant differences in the crash involvement of the two groups.

In the early years of HSDE, before it became so completely accepted by the American public as being an effective safety measure, this approach would have been considerably easier to carry out.

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*This point of view, of course, benefits from nearly five decades of hindsight.

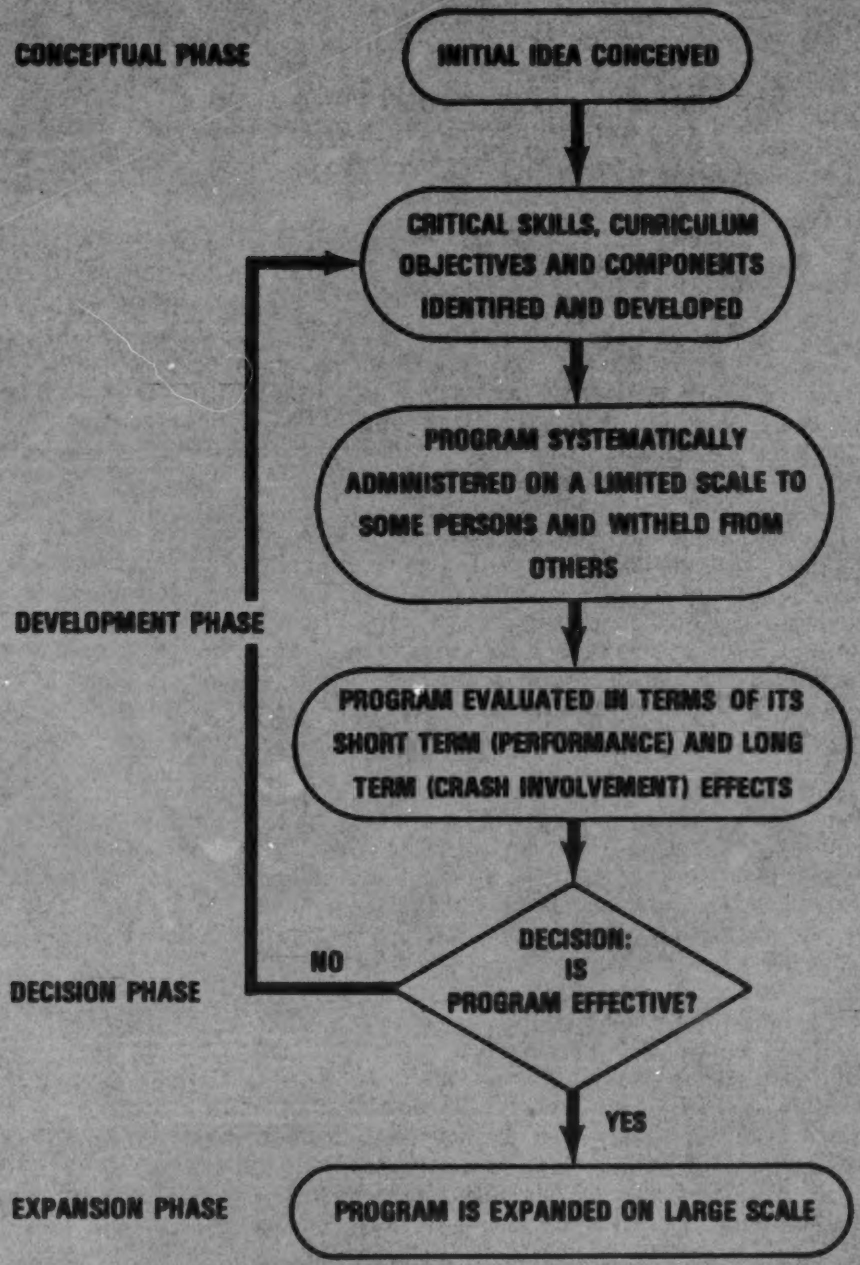
CONCEPTUAL PHASE
INITIAL IDEA CONCEIVED
CRITICAL SKILLS, CURRICULUM OBJECTIVES AND COMPONENTS IDENTIFIED AND DEVELOPED
PROGRAM SYSTEMATICALLY ADMINISTERED ON A LIMITED SCALE TO SOME PERSONS AND WITHELD FROM OTHERS
DEVELOPMENT PHASE
PROGRAM EVALUATED IN TERMS OF ITS SHORT TERM (PERFORMANCE) AND LONG TERM (CRASH INVOLVEMENT) EFFECTS
NO
DECISION PHASE
DECISION: IS PROGRAM EFFECTIVE?
YES
EXPANSION PHASE
PROGRAM IS EXPANDED ON LARGE SCALE

Figure 12

AN IDEALIZED MODEL FOR DEVELOPING AND IMPLEMENTING
HIGH SCHOOL DRIVER EDUCATION

Today, however—with nearly 73 percent of the eligible population receiving HSDE, with the generally held public view that HSDE is obviously better than no formal training, and with a Federal standard that promotes the expansion of HSDE to *all* eligible students—such an evaluation is very difficult, if not impossible, to implement. Political and moral issues, including the ethicality of

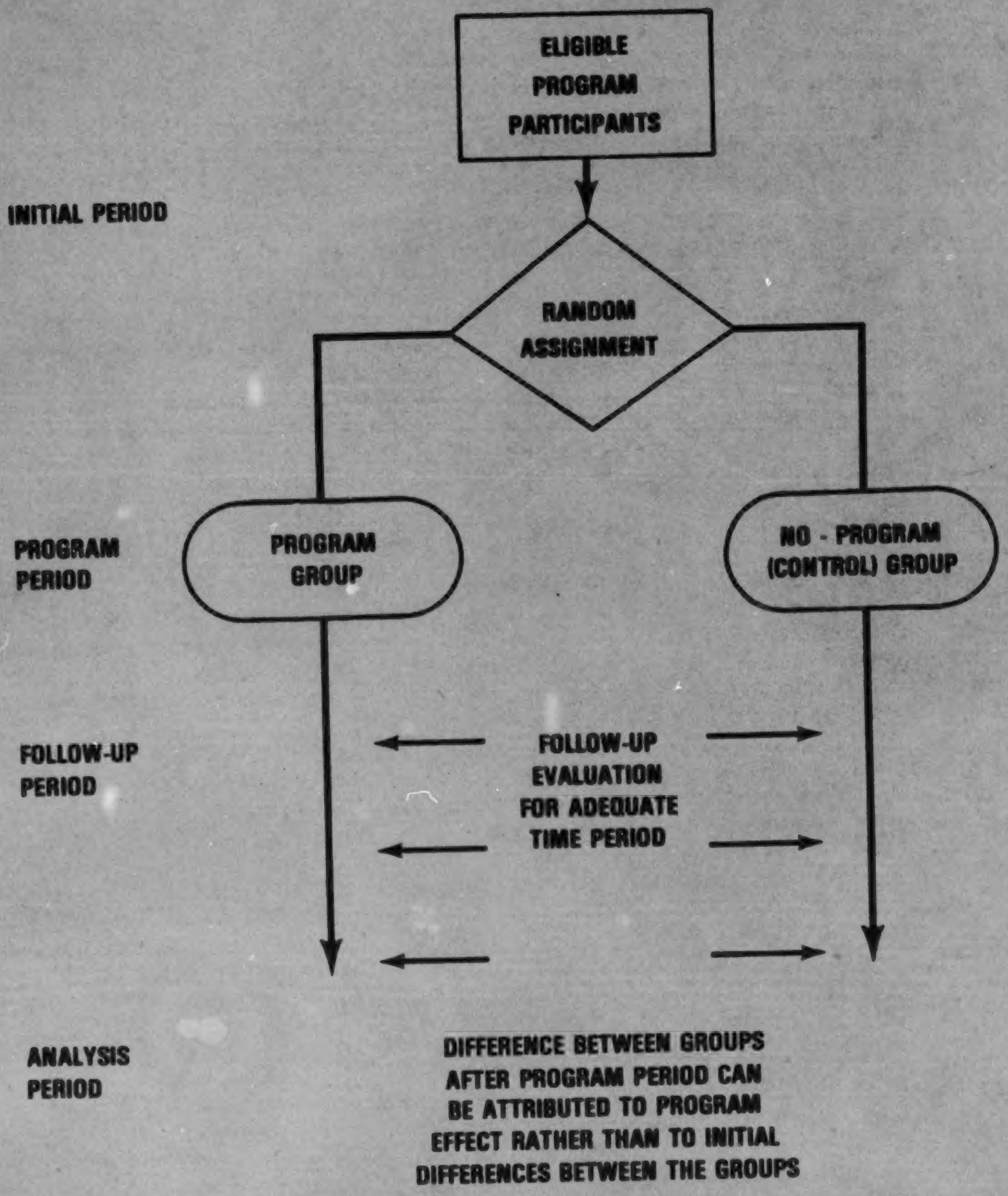
ELIGIBLE PROGRAM PARTICIPANTS
INITIAL PERIOD
RANDOM ASSIGNMENT
PROGRAM PERIOD
PROGRAM GROUP
NO - PROGRAM (CONTROL) GROUP
FOLLOW-UP PERIOD
FOLLOW-UP EVALUATION FOR ADEQUATE TIME PERIOD
ANALYSIS PERIOD
DIFFERENCE BETWEEN GROUPS AFTER PROGRAM PERIOD CAN BE ATTRIBUTED TO PROGRAM EFFECT RATHER THAN TO INITIAL DIFFERENCES BETWEEN THE GROUPS

Figure 13

CONTROL GROUP METHODOLOGY FOR EVALUATING PROGRAM EFFECT

refusing HSDE to anyone who wants it, preclude the possibility of an experimental evaluation of HSDE in nearly any area of the country. Furthermore, insurance companies have made the situation even more difficult by offering insurance premium reductions for persons completing HSDE. This policy, of course, is based upon 1) the fact that early studies showed HSDE students to have lower subsequent crash rates than students who did not take HSDE and 2) the assumption that HSDE training was the causal factor for this reduced crash involvement.

However, research to date suggests that it is primarily the self-selection process—i.e., who chooses HSDE and who does not—that accounts for the difference in crash involvement between these two groups. Thus, by encouraging all eligible students to take HSDE without first establishing its potential for reducing crash involvement, the insurance incentive approach may be confounding the very predictability for which it was intended. Surely, when the goal of extending HSDE to all eligible students is realized, any evaluation of the program will be precluded. These issues are certainly not new, and the need for an experimental evaluation of HSDE has been strongly voiced by a number of highway safety proponents as well as by more independent researchers. Goldstein, in his 1973 review (16), for example, summarized the situation as follows:

> . . . only random assignment beforehand assures the comparability of the groups on all relevant factors, including the quantity and quality of subsequent driving exposure of the two groups. And only random assignment beforehand permits the application of a body of statistical logic which makes it possible to evaluate the obtained differences . . . in subsequent driving records of the two groups. However, random assignment beforehand is difficult to achieve in real life, because if driver education is believed to be a "good" thing, both students and their parents are generally unwilling to permit their exclusion from driver education courses merely for purposes of research. Also, the legal requirement for driver education for licensing at certain ages in many States poses very real problems for random assignment.

Evaluation Criteria and the Problems Involved

One additional aspect of the evaluation process that is frequently discussed involves the criteria to be used in evaluating traffic safety education programs. The National Highway Traffic Safety Administration (NHTSA) has taken the position that the effect of such programs, in terms of highway safety, should be evaluated relative to the ultimate criteria of reduced crashes (and in some cases violations). While this position appears to be reasonably straightforward, several formidable obstacles stand in the way of an adequate evaluation based on such criteria.

The first problem involves the fact that driving records, as collections of crash and violation entries, are not very complete, often involve inaccuracies, and are subject to the whims of reporting officers, prosecuting attorneys, and traffic court judges. Thus, driving records probably have a high degree of "error variation" that makes them relatively insensitive measures of change. For example, if the driving records of a particular State have an error variation that equals or exceeds the estimated effectiveness of the program being measured, any change in subsequent records that results from the program will be "lost" in the pool of error variance. Thus, an effective program could be concluded to have shown no effect when, in fact, it did reduce crashes and violations. The solution, it would appear, requires maximizing the quality (and effectiveness) of the program and minimizing the number of errors and nonentries in State traffic records.

Others have taken a different approach, and have based entire program evalutions on short-term or intermediate criteria such as *knowledge* levels, *attitude* changes, and various *skill performance* measures. This approach is perfectly valid, as long as such measures are in some way related to effectiveness in terms of crash reductions. One may try to fool oneself, and others, by stating that the goals of driver education are to improve knowledge, change attitudes, and improve driving skills. For a highway safety program, however, these are nothing more than *objectives*, which, it is hoped, lead to the ultimate *goal* of preventing crashes. It is true, as Zylman (76) has suggested, that measures such as knowledge, attitude, and skill level changes may have nothing to do with subsequent driving records. This does not mean, however, that the *driving records* are an invalid criterion for evaluation. It means that the *intermediate measures*, to the extent that they are unrelated to subsequent crash records, are inappropriate measures on which to base a program evaluation (16, 77, 78). That is not in any way to suggest that intermediate performance level criteria should not be used in the development and pilot testing of a program. Often these relatively sensitive measures of change are the primary means by which a newly developed program can be molded into a maximally effective program. However, unless effort is continually exerted to develop performance measures that are valid predictors of subsequent crashes, these criteria cannot be used to determine the value of the program as a highway safety countermeasure.

Other significant problems involved in the use of driving records involve variations in enforcement, adjudication, or reporting procedures from one time or location to another. While these variations can cause considerable problems for "before and after" studies, and studies that compare the records of drivers from different geographical locations, such problems are minimized when random assignment procedures are employed. Goldstein (79) provides an excellent discussion of these and other aspects of driver education evaluation problems.

B. High School Driver Education Issues

Teacher Preparation

Obviously, when the HSDE movement began early in the 20th century, there were few driver education teachers available. In order to meet the demand created for such persons, teachers were borrowed from other disciplines (e.g., physical education) to teach HSDE part time. Many teachers from other disciplines picked up driver education as a sideline activity to supplement their salaries, and few of these borrowed instructors received more than a short course to prepare themselves for their driver education duties. Many received no formal preparation at all. As a consequence, HSDE soon established itself as a teaching endeavor of secondary importance to instructors and administrators alike (80, 81).

Efforts to provide adequate training, guidance, and organization for instructors developed quite slowly. Some of the more significant attempts to improve this state of affairs included the establishment of traffic safety centers to train HSDE instructors at various universities and the four National Conferences held by the National Commission on Safety Education (NCSE) in 1949, 1953, 1958, and 1963. These conferences attempted to improve teacher training and standardization by establishing program guidelines and minimum teacher certification requirements. As was already indicated, however, NCSE was virtually powerless to enforce such guidelines and standards. With the passage of the Highway Safety Act of 1966 and its accompanying grants-in-aid programs, however, some pressure was exerted on the States to meet minimal standards. Unfortunately, primary emphasis was placed upon program *expansion* rather than on program *improvement.*

A 1964 questionnaire analysis (82) of the quality and content of safety education programs offered by major colleges and universities came to the following conclusions:

- The States were not meeting even the most minimal requirements for teacher preparation and certification.
- Introductory preparation courses for HSDE instructors were extremely variable in quality, quantity, and emphasis.
- Few of the instructors offering such courses had sufficient experience in such areas.

A review of recent publications in the area of HSDE suggests that, although such professional emphasis is now being placed on improving teacher preparation, it is unclear how much the situation actually has changed in recent times. One recent State survey of teacher preparation (83), for example, found that only 39 percent of the HSDE teachers in that State (South Carolina) had received any form of advanced driver education training. This study also indicated that only about 35 percent of the driver education instructors surveyed were teaching HSDE as their principal teaching assignment.

To complicate the situation, it has never been determined exactly what type of a person (or preparation) results in the most effective HSDE instructor. Furthermore, financial constraints in some areas have prompted school administrators to pursue alternative courses with regard to laboratory (behind-the-wheel (BTW)) phases of the program. Perhaps the two most controversial practices resulting from this situation involve 1) the use of teaching assistants or "paraprofessionals" and 2) contracting with commercial driving schools to provide in-car training. These practices, of course, have resulted in a highly emotional professional debate concerning whether such alternatives result in a poorer quality of instruction.

With regard to the paraprofessional issue, the American Automobile Association (AAA) and most of the HSDE teaching profession have taken the position that both driving and classroom instruction should be given only by properly certified secondary school teachers (84). However, there is no body of research evidence to support such a position. For the most part, in fact, there is no adequate body of research to support *either* position on this issue. Some proponents of such alternative programs claim that they can be both cost effective (85) and successful (86). Unfortunately, this debate does not provide much information with regard to any possible changes in the quality of instruction provided. To adequately determine if such changes are taking place, it is necessary to compare the driving records of students taught by paraprofessionals with the records of students by professionals. Few such studies have been reported in the literature. The South Carolina survey (83), already cited, included an evaluation of student ratings for BTW instructors with different teacher preparation backgrounds. No significant effect of teacher training on such ratings was found. However, this same study did show a significant positive correlation between instructor motivation and student ratings. If such positive ratings could be validated in terms of better subsequent crash rates for the students, this finding would be more meaningful.

A Texas study (87) specifically compared the effectiveness of teaching assistants (paraprofessionals) and certified instructors in administering the BTW phase of the Texas driver education program. In this study, the driving records of students of both types of instructors were compared. It was found that the students trained by paraprofessionals had unquestionably *better* driving records than those trained by certified instructors. Some caution should be taken in the interpretation of these results because they represent only one study, and only one State driver system.

In a later Texas study (74), the investigators reported a positive correlation between the amount of formal teacher preparation and the subsequent performance records of students. This same study also found that HSDE instructors with baccalaureate degrees in physical education did consistently poorer in terms of subsequent student driving records. This finding probably is not an indication that physical education training was detrimental to their ability to teach HSDE. Rather, it probably reflects the fact that many of such persons' primary responsibilities and interests lie in areas other than driver education. One particularly interesting finding was that instructors with a background in physics generally did better in terms of students' records than instructors without a background in physics.

Obviously, much more research is needed in this area to get an accurate view of the impact of paraprofessional involvement in HSDE. The same situation exists with regard to hiring commercial instructors to teach the in-car phase of HSDE programs. Results from the California Driver Education Training study (36), for example, would suggest that commercial driver education instructors teach the BTW phase of driver education at least as effectively as certified HSDE instructors. On reanalysis of the same data by Goldstein (73), however, such a conclusion is not supported. Other studies could be cited, but the conclusion would probably be on the order of "sometimes they do and sometimes they don't." To get a feel for how often and under what circumstances paraprofessionals or commercial instructors provide adequate BTW instruction, it will be necessary to implement controlled studies in *many* States. This effort, then, should be an integral part of the States' ongoing HSDE evaluation program (and of the Driver Education Standard).

Time Allocation and Course Content

It has often been suggested that classroom instruction alone is not as effective as more complete courses involving both classroom and BTW training. There is a considerable amount of research in the general area of human training that would suggest that programs which allow real world practice in skills are more effective than those which do not.

One of the major issues concerning time allocation is the contention that 30 hours of classroom training and 6 hours of BTW training (30 + 6 formula) are not adequate to prepare safety-oriented young drivers. As a result, several changes in emphasis have been developing in the HSDE area, which involve 1) the use of multimodal programs including classroom, simulator, on-range, and BTW components; 2) emphasis on comprehensive K-12 safety programs that begin safety education at a much earlier age; and 3) the development of performance-based, rather than time-based, HSDE curricula.

Recent emphasis on defensive driving and especially accident avoidance or emergency techniques have further complicated the problem by placing still another set of requirements on the HSDE program that must be met within a given time limit. While most professionals in this area seem to agree that emergency training is a necessary part of an adequate driver training program, there are some who feel that such training requirements cannot be met in a secondary school program (88).

The 30 + 6 formula was recommended at the first National Conference on High School Driver Education in 1943 and has since been upated. The fourth national conference, for example, recommended a full semester (90 hours) of training.

Unfortunately, many schools still have not been able to comply with the 30 + 6 requirements; most do not include simulator and driving-range phases in their programs; and few communities have comprehensvie K-12 safety programs.

This lack, when paired with the difficulties involved in changing human behavior, becomes one of the primary reasons why HSDE effectiveness studies have not been more successful in documenting the case for HSDE. Most critics, for example, are not so much skeptical of the logic of the driver education approach per se as they are of the ability for any *short-term* program to have a significant impact in molding behavior. Some (89) even doubt the ability of a full-semester course to have a significant impact.

Also within this area of discussion is the issue of *course content*, and to some extent *course standardization*. There can be little doubt that HSDE takes a variety of forms and shapes in its implementation across the Nation. It is hoped that the present emphasis on basing course content on driving task analyses, on curriculum and performance objectives, and on the results of frequent evaluation efforts will improve quality, standardization, and appropriateness of future curriculum components. There is considerable evidence in the body of present HSDE literature that this will be the case.

Before leaving this area of discussion, it would seem appropriate to point out some of the types of evaluations of curriculum components that have been conducted. With regard to *length of courses*, for example, the California Driver Training Study (36) represents perhaps the best controlled study of long versus short courses available to date. This study found that short (6-hour) BTW courses did just as well, in terms of student driving records, as did long (10-hour) BTW courses. This conclusion held true for both commercial and public administration of the programs.

Most of the programs evaluated in the California study were two-phase (classroom and BTW) or three-phase (classroom, simulator training, and BTW) programs. Comparing three- and four-phase programs with two-phase programs, the 1972 Texas Study (74) reported consistently better results for the more complete courses. This study also reported that programs with highly standardized educational television (ETV) classroom components were superior to programs that did not include ETV.

It should be pointed out that while the foregoing investigations used subsequent driving records as their evaluation criteria, the majority of studies in this area have used only knowledge, attitude, performance scores, or student ratings as their criteria for evaluation. One pertinent relationship that can be reported here, and that is replicated in other program areas, is the finding that positive program effects are frequently documented with regard to knowledge criteria, in many cases with performance criteria (skills), less often with attitude criteria, even less frequently with regard to violation measures, and very infrequently with regard to "bottom line" crash measures (140). This relationship should be kept in mind when reviewing the many simulator, multiple-car-range, accident avoidance, and other innovative program component evaluation reports.

It is apparent that, at the very most, the fragmentary studies that have been conducted and reported in this section cannot be used for definitive decisionmaking. Only with a reasonably large body of research literature, which provides some consistent trends with regard to any of the issues discussed, can one make use of such studies for effective decisionmaking. When the results of studies, such as those cited above, have stimulated a sufficient number of persons to conduct their own evaluations, and when most States have comprehensive, controlled HSDE evaluation programs, sound answers will be forthcoming.

C. Other Driver Education Activity Areas

Adult Driver Education

Adult drivers represent a rather all-inclusive target group to which a number of safety education programs have been aimed. Some of the most frequent forms of such programs have included: 1) commercial courses for adult beginners, 2) defensive driving courses for all drivers, 3) accident avoidance or emergency driving courses for all drivers, including drivers of special vehicles, and 4) mass media programs for drivers and nondrivers as well. Perhaps the best known of the adult training programs has been the National Safety Council's *Defensive Driving Course* (DDC), developed in 1964 and subsequently administered by nearly every local safety council in the United States to countless industries, universities, and other public and private agencies. Basically, DDC is a highly standardized program designed to teach drivers skills that will keep them out of crash situations. Thus, the course is not aimed at teaching emergency skills, but rather skills in how to stay out of emergencies. The content of the course is similar to that developed for the commercial-driving industry for improving the performance of professional drivers. The Smith-Cummings-Sherman (80) system for commercial drivers, for example, is somewhat similar, as it also involves the development of systematic visual habits for evaluating the traffic situation and recognizing potentially hazardous conditions. The need for such training is suggested in a National Academy of Sciences report (90), which estimates that approximately 90 percent of the decisions made by human beings are influenced primarily by immediate visual stimuli.

The DDC has considerable face validity as a safety countermeasure, and has an extremely high level of acceptance among the safety community and the general public. In fact, its acceptance resembles to a great extent that of HSDE. So, too, do the studies of its effectiveness. Just as with driver education, DDC has been extensively promoted before its effectiveness has been established. Even now there is little more than a massive number of "before and after" case studies to support its usefulness. Such studies, however, can be quite convincing to the non-research-oriented person (and to some researchers). For example:

- Military personnel at several bases, after involvement in intensive traffic safety programs, including DDC, reduced their crash involvement by 50 to 65 percent.
- A group of county government drivers who were trained in DDC were reported to have 50 percent fewer preventable crashes than their nontrained counterparts.
- After training 2,250 forest service personnel in the DDC, the personnel crash rate for this particular group declined from 6 reportable crashes per million miles to 3.43 per million miles.

While many additional case studies could be described from a 1968 report by Imhoff (91) the foregoing examples are typical.

Unlike the HSDE effectiveness studies, which suffered primarily from a self-selection bias problem, many of these studies are difficult to interpret because of what is often called "the Hawthorne Effect." This term refers to the fact that people often change their behavior when they know they are being watched. Record-keeping procedures also have a habit of changing after programs have been implemented.

An early study of DDC involved volunteers who took the course, volunteers who did not take the course, and nonvolunteers who did not take the course. The investigators reported significant knowledge and attitude changes for course takers (92). Such changes, however, appeared to be somewhat unstable after the first 6 months of followup.

In a more recent study, 8,182 DDC graduates in 26 States were surveyed by means of questionnaires regarding their crash and violation histories for the year preceding their exposure to DDC (93). The driving records of 72 percent of these drivers were also surveyed for the year following exposure to DDC. The DDC graduates reported 32.8 percent fewer crashes and 24.9 percent fewer violations in the year after exposure to DDC as compared to the year preceding exposure to DDC. A comparison group of persons not exposed to DDC was surveyed as well. The report indicated that the DDC group had crash and violation rates lower than the comparison group. Further, a survey of State records indicated that the DDC group had 17.6 percent fewer crashes and 12.5 percent fewer violations in the year after DDC than in the year before DDC. The comparison group had 11.9 percent more crashes and 12.4 percent fewer violations in the post-DDC time period than in the pre-DDC time period.

While DDC does have considerable face validity, and the results of the latter study are encouraging, the fact that no experimental evaluation of DDC has taken place to date is indicative of the continuing pseudoevaluation climate of the 1960's. Surely there is little reason why this program could not be systematically implemented in a number of controlled studies to determine its worth, especially in view of the criticsm imposed on HSDE for similar failures.

A second form of accident avoidance training involves *emergency skills training,* which is aimed primarily at developing proper response habits to handle unexpected blowouts, near collisions, mechanical failures, loss of traction, and so forth. The theory behind such training is that emergency situations require immediate, specific responses on the part of the driver and, unless such responses are practiced at some point in time, they will not be available in the driver's response repertoire. In most cases, the untrained driver will respond incorrectly or will not respond at all.

On the other side of the coin, there have been some criticisms concerning the inclusion of such training in HSDE programs. Some of these negative viewpoints include the following: 1) Few programs involve enough time to develop emergency skills; 2) these skills can be misused in efforts to "show off," thus creating crash situations; 3) a certain degree of danger is involved in emergency skill training; 4) such training requires expensive equipment and facilities; and 5) a student driver does not have sufficient experience to be taught emergency skills. These problems have resulted in considerable skepticism regarding the desirability of including such courses in HSDE programs. For the most part, however, emergency skill components *are* being included in newly developed programs wherever facilities and equipment permit.

The use of emergency skills training has received much less opposition in the form of *advanced* driver education programs. A variety of private programs has been developed for emergency vehicle drivers as well as for the general public. One of the most recent of such programs is the "advanced" driver education program developed by General Motors (94). This program has been developed to handle specific driving emergencies that crash data indicate are of particular importance in the etiology of a crash. In this program, training exercises in offroad recovery, skid control, controlled braking, evasive maneuvering, steering on a serpentine course, and handling tire failures have been designed to be used in conjunction with classroom instruction.

In an initial application of this program for 30 police officers (hardly an adequate sample size to produce any valid results), it was reported that these trained officers had 50 percent fewer crashes over approximately a 17-month period than a comparison group of untrained officers.

In view of past comments, it probably is not necessary to review the inadequacies of this study. It is hoped that adequate experimental evaluations of these relatively expensive programs will be accomplished early in their developmental history. As indicated in section eight, NHTSA has plans for an evaluation of such an accident avoidance program. As Goldstein has pointed out, however, the scientific evaluations of "advanced" programs at present are conspicuous for their absence.

The *commercial driving school* represents the primary means by which an adult beginning driver receives formal driver education and training. Commercial schools have been in existence since long before the public school programs were initiated. As was suggested in the effectiveness section of this report, such schools have often been the subject of criticism from the HSDE community, and earlier studies appeared to support such criticisms. The basic problem appears to stem from the lesser preparation in driver and traffic safety received from most commercial instructions, along with the corner-cutting policies that are usually inherent in profit-motivated programs. However, the recent *California Driver Training Evaluation Study* (36), which found that commercially trained students had just as good records as HSDE-trained students, has taken some of the "steam" out of anticommercial school critics. It is hoped that the California study reflects an improvement, over the years, in the quality of commercial driver education programs. Quite possibly it represents an effect due to a combination of 1) a 41-hour preparation course for the commercial instructors who took part in the study and 2) the unpredictable effects of being watched. Then, too, there is the Goldstein critique of study (73) and its finding of superior performance for young males exposed to the public school programs.

With regard to commercial school and instructor requirements, NHTSA's *Driver Education Standard* requires that commercial driving schools be licensed and that commercial driving instructors be certified in accordance with specific criteria adopted by the State. At present, it appears that all States are adequately complying with that provision of the standard.

A final area that should be touched on in the category of adult programs involves *mass media programs,* such as one conducted by Kentucky University in 1967 (95). In this program, the effectiveness of a "candid camera" type of driver education program was measured by studying the changes in driver errors at 8 local intersections and analyzing changes in the crash rate for 48 local intersections (a seemingly very insensitive measurement approach). The televised program itself consisted of an 18-month series of 2-3 minute traffic safety films showing local drivers in the process of making various errors and followed by an example of the correct driving sequence for that situation. The findings of the study suggested that postprogram driver errors and total crashes were reduced by

17.4 percent and 12.5 percent, respectively. Given past efforts to evaluate other forms of educational approaches and the difficulty in obtaining positive results, the present study must be viewed with certain reservations. The technique, however, represents an innovative approach that is being investigated further by NHTSA.

Elderly Driver Programs

As was indicated in the target population section of this report, driver education programs for the elderly represent a relatively new program effort. The studies by Marsh (24) and by Planek et al. (6) suggest some relatively unusual problems of the elderly driver. In addition, the latter study suggested some possible approaches to the problem that could be undertaken. They include:

- The preparation and distribution of self-help guides
- Conducting vision-testing programs
- Campaigns to motivate physicians to warn elderly patients with regard to the use of drugs while driving
- Establishment of special driving clinics for the elderly

While this list is not exhaustive, it does represent some of the more apparent options. Unfortunately, few such efforts have been attempted, and this review uncovered no evaluation of such a program to date.

Motorcycle Education Programs

The following data reflect the trend in approximate numbers of motorcycle registrations in the United States:

1945 – 200,000
1950 – 450,000
1955 – 400,000
1960 – 550,000
1965 – 1,400,000
1970 – 2,800,000
1975 – 5,000,000

It is apparent from the foregoing data that a dramatic increase in the number of motorcycles has occurred since the early 1960's. In addition, as Hartman (97) has pointed out, these figures do not include the sizable number of offroad motorcycles being produced, sold, and used in the United States. Furthermore, continued fuel shortages are expected to increase the number of cycles being used even more. With these facts in mind, together with the fact that cyclist deaths have doubled since 1965 (from 1,515 in 1965 to more than 3,300 in 1974), it is apparent that large-scale efforts in this area of highway safety are imminent.

Because a large proportion of serious and fatal crashes occur to drivers with very little riding experience, education, training, and licensing programs should have a good opportunity for making a substantial impact. In fact, in a 1968 study conducted for NHTSA (98), it was suggested that the most cost-effective programs that could be implemented in the motorcycle area would be 1) operator licensing and testing programs and 2) operator education programs. In 1972 the Motorcycle Safety Foundation (MSF) was established by several motorcycle manufacturers to deal with the problem. Some of the activities of this new foundation included: 1) developing, testing, and making available performance-based curriculum packages for motorcycle driver education programs, and 2) seeking ways to make automobile drivers learn how to interact safely with motorcyclists in traffic. The latter activity is particularly important in view of the fact that in most motorcycle/automobile crashes the driver of the automobile is considered primarily at fault.

It is refreshing to find an area of development where there is consciousness of the mistakes made in past traffic safety education efforts. In an effort to avoid the problems associated with teacher preparation, MSF has already launched a series of teacher preparation workshops for college and university faculty. In addition, MSF has capitalized on NHTSA efforts in the curriculum development and evaluation area by funding a motorcycle task analysis to provide the basis for the performance-based motorcycle education curriculum. Also, in conjunction with NHTSA, MSF is supporting efforts in the development of performance measures. An early experimental evaluation of a motorcycle licensing program and a later demonstration of a motorcycle education program that will employ random assignment and control groups in their experimental design are already being planned by NHTSA. A brief summary of the major events in this area includes the following:

1967	The National Highway Safety Bureau issues Motorcycle Highway Safety Standard.
1968	Reiss and Haley report (98) suggests that the most cost-effective approaches in this area would involve licensing and education efforts.
1969	The National Education Association publishes "Policies and Guidelines" for motorcycle educators.
1972	The MSF is established, and begins conducting teacher preparation workshops.
1974	Motorcycle task analysis is conducted by MSF.
	Plans for NHTSA motorcyclist licensing demonstration program are developed.
1975	Development of motorcycle driver education curriculum specifications is begun by NHTSA.
	The NHTSA motorcycle licensing demonstration project is launched. (Planned start is July 1975.)

This area of traffic safety education may prove to be the most efficiently developed of all. To date, however, no evaluation of the crash or violation reduction potential of a motorcycle operator education program exists.

Driver Education for the Handicapped

One area of driver education that is being pursued in several locations throughout the country involves the training of physically and mentally handicapped persons. The need for such training is based primarily on the humanitarian aspects of providing as rich and rewarding a life as possible for such persons. A 1968 HEW study (99), for example, estimated that more than 100,000 handicapped persons are presently locked into unemployment by the lack of transportation. While these figures were translated into dollars and cents in terms of welfare benefits and potential earnings, the significant aspect of the study, and the primary reason for developing driver training programs for the handicapped, involves the potential for alleviating some of the restrictions placed on the lives of such persons.

One important issue that results from such efforts involves the potentially detrimental effect, in terms of increased overall crash risk, that could result from aiding the entry of the handicapped into the driving population. To get a feel for the probabilty that such increase would occur, a review of past studies of handicapped drivers is appropriate. It should be pointed out that some studies, such as that by Gutschall (100), have suggested the need to separate programs for the *physically* disabled from those for *educable mentally retarded* (EMR) persons. The reasons for this separation involve the different deficiencies and needs that are characteristic of the two groups, especially with regard to the greater learning difficulties of the EMR's.

Regarding the physically handicapped, a number of studies and articles can be found to support the belief that such persons have a good potential for safe driving (100, 101, 102, 103, 104, 129). Some of these studies were based on the ability of various physically disabled persons to become *licensed*, and some were based on the *driving records* of various types of physically handicapped persons. While the data provided in these studies are not particularly controlled or conclusive, there is some suggestion that many physically disabled persons can be successfully licensed and apparently compensate quite well for any deficiencies they might have. The exceptions appear to be persons with hearing deficiencies (104, 129).

With regard to EMR's, the situation appears to be a little more bleak in that the inability of this group to understand abstract concepts appears to provide a reasonably formidable obstacle to meeting licensing requirements. There certainly is not much research to support the contention that EMR's have significantly worse driving records than the average driver. There are some reports, however, such as a 1967 report by Egan (130), to suggest that this may be the case. In fact, the latter study, which compared EMR's with regular students receiving driver training, suggested that EMR's may be expected to have twice the crash rate of normal drivers.

Other problems and questions that arise in the area of training the physically and mentally handicapped include 1) the lack of uniform State licensing standards, 2) the lack of qualified instructors to teach driver education to the physically and mentally handicapped, 3) the cost of including such programs in an HSDE curriculum (especially in view of the need for separate programs for the various handicap types), and 4) a lack of research defining the needs, problems, and past crash records of various disability types.

Problem Driver Education Programs

When a driver has accumulated a significant number of violations or crashes, he is identified as a *problem* or, in some cases, a *near-problem* driver by the State licensing agency. Usually such a person receives some type of intervention, such as a warning letter, license revocation (or suspension), or assignment to a driver improvement program. These programs vary from short interviews with a driver improvement analyst to various forms of education and group dynamics programs. Since this report is intended primarily as a review of driver education efforts, the results of studies concerning other forms of intervention will merely be summarized from a 1970 review by Nichols (96), as follows:

- Less threatening interventions appear to be more effective in improving subsequent driving records than do more threatening interventions (131, 132, 133).
- *Personalized* contacts with problem drivers appear to have short-term beneficial effects (132, 134).
- Any measurable effects resulting from such programs are likely to be short-term unless some sort of followup is attempted (135).
- The driving record of a problem driver can be expected to improve because of "regression to the mean," and may improve as a result of his awareness that he has been called to the attention of authoritative figures (16).
- Violations appear to be more easily impacted by driver improvement procedures than are crashes (137).

One of the primary problems involved in this area of intervention is the extreme difficulty of changing human behavior that is based on many years of learning and habit formation. Thus, it is highly unlikely that *any* short-term intervention will have a significant effect on such behavior, especially if the subject matter (in the case of educational programs) is not at least appealing and if some sort of followup is not attempted. Compounding this problem, State motor vehicle departments cannot implement long-term programs because of logistics and cost problems, as well as the sheer number of persons involved at many locations throughout the State.

Goldstein (138) reviewed the literature in this area in 1971 and concluded that such programs have shown reductions in violations ranging from 21 to 73 percent, and reductions in crashes ranging from 15 to 69 percent, compared with the records of control groups. Other reviews, including a 1973 paper by Goldstein (139), have been less optimistic in their assessment of the effectiveness of such programs. In a 1968 review of the major controlled studies conducted as of that date, Kaestner (137) reported that all eight studies reviewed reported significant decreases in *violations*, but only two of the eight studies *suggested* trends toward reduced *crashes* after exposure to the various driver improvement programs. One of the problems involved in obtaining significant effects with regard to crashes may have arisen because, in most cases, the sample sizes were not sufficiently large to permit detection of effects of small magnitude. This problem is particularly common in crash-based evaluation studies. Some of the additional conclusions that have resulted from studies in this area are summarized (140) as follows:

- Even though the measurable difference between persons exposed and persons not exposed to driver improvement programs are short in duration, such programs are worthwhile if they hasten the improvement of problem drivers and, thus, partially neutralize high-risk periods.
- Randomly assigned control group procedures will be required to determine whether any change results from the treatment per se or from time alone (regression to the mean).

Educational Programs for Drinking Drivers

Usually associated with traffic courts rather than motor vehicle agencies, alcohol education programs for convicted drinking drivers have been used increasingly since about the mid-1960's. Two of the most dramatic increases in the use of such alcohol education schools have come about through 1) NHTSA's alcohol countermeasure program and its 35 Alcohol Safety Action Projects, implemented in 1970, and 2) AAA's DWI* Counterattack program. These efforts in turn appear to stem primarily from the "DWI Phoenix" program implemented in 1967 in Phoenix, Arizona (141). The number of such programs has expanded rapidly in recent years and involves programs ranging from short (2-hour) lecture courses to longer term (20-30-hour) group dynamics programs.

Unfortunately, the evaluation of such programs has not been commensurate with their expansion. In spite of the fact that several States are already legislating mandatory attendance to such programs for persons convicted of DWI, virtually *no* sufficient evidence exists to support the conclusion that such programs have any effect whatsoever in reducing crashes. Several recent NHTSA reports have reviewed this situation (140, 142, 143). In fact, in a review of more than 40 such programs, Nichols and Reis (142) suggest that purely lecture-oriented courses may have a *detrimental* effect on the more severe problem drinker types. This result is discussed more completely in section eight.

Here we are faced with a familiar situation in that some programs will probably have a positive effect for certain types of persons, no effect for other types, and possibly detrimental effects for still others. Still, too few people are sufficiently interested in sorting out these various possible outcomes. To do so would require breaking away from present assignment procedures and randomly assigning persons to a variety of educational alternatives. Most courtworkers continue in the ill-founded belief that they already know which programs will benefit various clients. Also, most program administrators in this area feel that a "shot in the arm" of education is better than nothing at all. Research, however, does not support such an assumption.

As in the HSDE area, the solution does not appear to be to discard the programs. Rather, the solution would appear to involve limiting the expansion of such programs until their effectiveness for particular client types has been established. No such program should be implemented without an adequate evaluation design to assess its impact. It is felt that NHTSA is making considerable progress in this area of program implementation and evaluation.

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*Driving while intoxicated.

Section Seven

NHTSA EFFORTS IN THE DEVELOPMENT AND EVALUATION OF A MODEL DRIVER EDUCATION PROGRAM

A. Introduction

The approach being taken at present by the National Highway Traffic Safety Administration (NHTSA) to develop, evaluate, and implement effective driver education programs was actually begun in 1968 while NHTSA was still the National Highway Safety Bureau. The primary component of this approach, which is also the nucleus of the present Driver Education Evaluation Program (DEEP) study, involves the development and evaluation of a model High School Driver Education (HSDE) curriculum called the Safe Performance Curriculum (SPC). The earlier sections of this initial report on the DEEP study were intended to provide the background of driver education program efforts and issues that preceded the development of SPC. This section will attempt to describe the *development* and *pilot-testing* phases of SPC, as well as the *demonstration* phase of the project, which is at present in the planning stages. Following this section will be a review of various "spin-offs" from the SPC project, as well as a description of NHTSA efforts in areas of driver education other than HSDE.

In developing its HSDE research program, NHTSA adopted what was essentially a two-pronged approach in which primary emphasis would be placed on evaluating HSDE in terms of its crash reduction effectiveness, but in which considerable emphasis would also be placed on *improving* the quality of existing driver education programs. The series of events involved in the development of SPC are shown in figure 14.

B. Early Planning Studies in NHTSA's Driver Education Evaluation Program

As is already apparent from preceding sections, there are many considerations in a proper evaluation of driver education. For example, there must be a clear statement of the objectives against which the program is to be measured. Then, too, it is all too apparent from the failures of past studies in this area that a rigorous and proper research design must be employed in order that the results obtained have any potential for interpretation. Even before these requirements can be met, however, it must be possible to define and describe the program being evaluated. As pointed out in the "Issues" section of this report, HSDE programs vary widely among the States, within any one State, within school districts, and usually even among teachers within the same school.

To lay the proper groundwork for a research and development program that would take these and other requirements into consideration, NHTSA awarded four separate but parallel contracts in 1968 for the purpose of developing "a concrete plan or plans for evaluating the effectiveness of current or proposed driver education programs." These contracts were awarded to New York University, Dunlap and Associates, the Institute for Educational Development, and American University. The final reports of these four studies were submitted during the summer of 1968. The four reports contained many common elements as well as a number of unique features (105, 106, 107, 108).

To synthesize the information provided in these reports into a single body of information and recommendations, a contract was awarded to the National Academy of Sciences, Highway Research Board (HRB), in 1969 (109). Specifically the primary task involved in this contract was to synthesize the various evaluation plans and instruments included in the four final reports and to develop a single optimal plan for evaluating driver education. The plan that developed from this contract

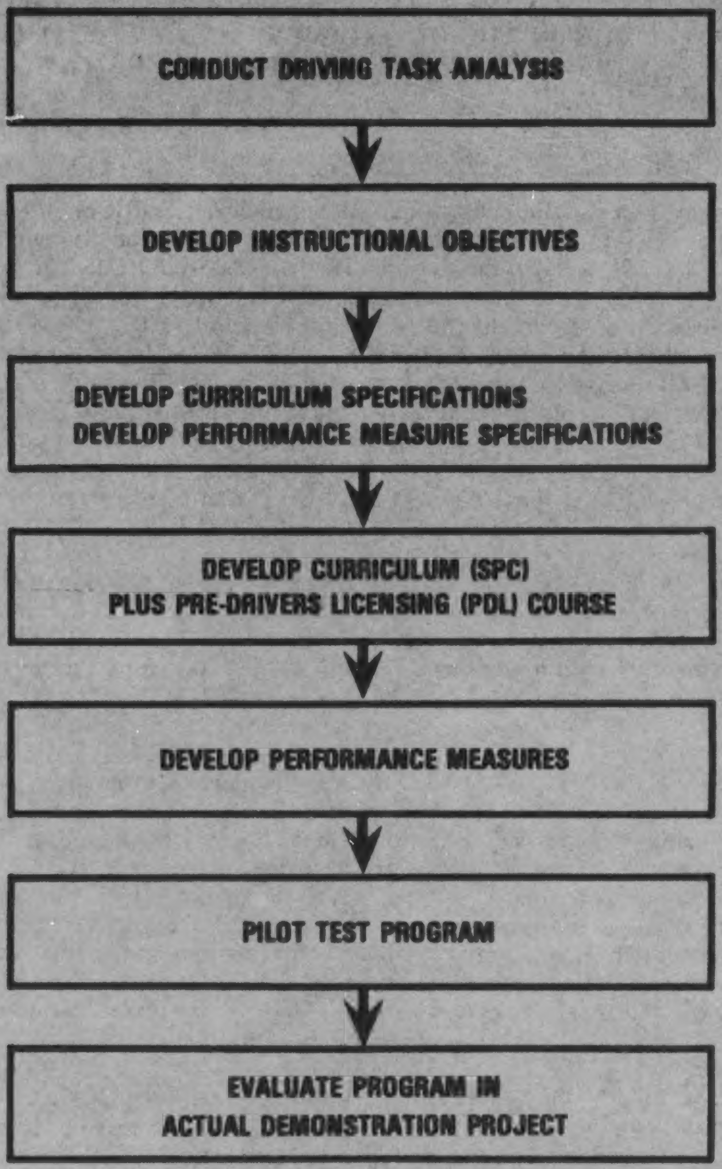

CONDUCT DRIVING TASK ANALYSIS
DEVELOP INSTRUCTIONAL OBJECTIVES
DEVELOP CURRICULUM SPECIFICATIONS
DEVELOP PERFORMANCE MEASURE SPECIFICATIONS
DEVELOP CURRICULUM (SPC)
PLUS PRE-DRIVERS LICENSING (PDL) COURSE
DEVELOP PERFORMANCE MEASURES
PILOT TEST PROGRAM
EVALUATE PROGRAM IN
ACTUAL DEMONSTRATION PROJECT

Figure 14

HISTORY OF THE SAFE PERFORMANCE CURRICULUM (SPC)
DEVELOPMENT AND EVALUATION

defined both *short-* and *long*-term efforts that would be required for a proper evaluation of HSDE. The immediate or *short-term* efforts that would be required included the following:

1. Identification and analysis of the various *tasks* involved in driving, as well as the knowledge, skills, and attitudes required for the performance of these tasks
2. Determination of program *objectives*, based on the foregoing task analysis as well as the requirements of the highway traffic system

3. Development of an instrument for *measuring* the degree to which the program meets the *short-term* objectives for which its contents were intended

An additional component of these short-term requirements was also specified, which involved:

4. Development of *specifications* for measures of *performance* and for an appropriate *research design*

The *long-term* efforts or requirements identified in the HRB report included:

5. Development (and eventually validation) of actual performance measures based on the specifications already developed
6. Actually conducting the long-term evaluation project(s)

It was anticipated that the above plan would allow for 1) an early evaluation of existing HSDE programs in terms of their specific contents and instructional objectives (e.g., knowledge and attitudinal objectives) and 2) an intermediate "performance" level evaluation of such programs to determine the extent to which program graduates could successfully complete driver proficiency tests capable of predicting "real-world" driving performance. Plans for a long-term program evaluation in terms of the ultimate goal of reducing the probability of crash involvement developed later.

C. Initial Task Analysis Project Awarded in Response to the HRB Plan

Work was begun, according to the plan, in 1969 with the awarding of the *Driver Education Task Analysis* contract (110) to the Human Resources Research Organization (HumRRO). In this project, the tasks involved in operating a four-wheel passenger car were analyzed to define the specific behaviors that must be performed. More than 1,700 behaviors were identified. Each behavior was then rated for its criticality. Some of the considerations involved in this criticality assessment included: 1) the frequency with which the behavior is required, 2) the likelihood that the behavior would be performed incorrectly, 3) the likelihood that incorrect performance would be related to crash involvement, and 4) the severity of the crash likely to be related to such incorrect performance. It was felt that if HSDE were to be effective in reducing crash involvement it would have to concentrate on training students to perform correctly critical driving tasks and place the greatest emphasis on those tasks most critical to safe driving. Thus, HSDE instructional programs and their objectives should be developed around such tasks.

The results of the task analysis were documented in a set of highly detailed *task descriptions* (111) intended to identify both the overt and covert behaviors involved. These task descriptions were then employed to develop the *instructional objectives* for a driver education program. These objectives describe the specific performances, knowledges, skills, and attitudes that must be achieved by instruction.

The instructional objectives were then grouped into 74 learning units, each of which included 1) a purpose, 2) performance objectives, and 3) enabling objectives. The *performance objectives* were specific performances that must be demonstrated to meet the purpose of the unit. The *enabling objectives* were detailed descriptions of the knowledges and skills the student would have to possess to meet the performance objectives.

Because it did not seem reasonable to expect that all students would attain all objectives, it was necessary to establish minimum levels of acceptable performance. To this end, the performance objectives were classified into five levels of criticality, and each level was assigned a minimum standard of performance. Four separate report volumes were developed as a result of the above-described *Driver Education Task Analysis*, as follows:

- Volume I: *Task Description* (111)

- **Volume II**: *Task Analysis Methods* (112)
- **Volume III**: *Instructional Objectives* (113)
- **Volume IV**: *The Development of Instructional Objectives* (114)

The final step in this initial contract response to the HRB plan was to design an *evaluation instrument* capable of measuring the extent to which the student attained various specific objectives. The evaluation instrument developed for this purpose consisted of the following three tests and the areas of measurement for which they were intended:

- Driving Fundamentals: an offroad test to assess the student's basic ability to control the directional motion of an automobile
- Driving Situations: an on-road test in ordinary traffic to assess the student's ability to deal with a broad range of "real-world" driving situations
- Driving Knowledge: a 105-item written test designed to assess the student's mastery of certain enabling knowledges

D. Additional Attempts to Develop Improved Performance Measurement Methods

Several projects are appropriate in relation to the development of performance measurement systems. One attempt was undertaken in a contract with Michigan State University (115). The purpose of this project was to develop a reliable method for measuring in-car driving performance that could be used for evaluating and improving HSDE methods. The procedure developed in the study was intended to measure driving behavior patterns in actual traffic situations using the simultaneous ratings of two observers. The procedure, however, proved to be too demanding, time consuming, and expensive to be of any practical value for routine large-scale use by driver educators and driver license examiners.

One method of performance measurement suggested by the HRB study, which does not require observers, involves the use of instrumented vehicles. Several types of these vehicles have been developed and used for a variety of research efforts.

Perhaps the most widely known of these devices is the highway safety research car developed by the Ford Motor Company (116). This car, which includes a variety of sensors and counters and a steering wheel that measures the driver's galvanic skin response (stress) and pulse rate, has been used in a variety of driver education evaluation projects (117, 118). Even though a correlation with driving simulator measures was established to a reasonable degree in a project by Ellingstad and coworkers (119), in most such investigations it has been difficult to translate the performance measures available from such vehicles into any form that can be interpreted as safe or unsafe driving.

Consequently, a contract was awarded to Systems Technology, Inc. (120), to develop an improved driver performance measurement and analysis system that would permit a determination of real-world driver-vehicle interaction and, it was hoped, a discrete measurement of good and bad driving. Such a system has been developed and a program has been initiated to measure driver decisionmaking processes. This system should be useful in measuring the attainment of specific objectives within an HSDE course. Whether the measures that this system provides will enable the prediction of subsequent crash experience is unknown at present, and will require testing with large groups of subjects over an adequate period of time.

E. Content Analysis of Existing Programs

Following the development of the instructional objectives for HSDE programs, a content evaluation of existing driver education curricula was needed to determine whether such programs were designed to meet the identified objectives and, it was hoped, the real-world performance measures under development. An informal review of existing HSDE curriculum materials, however, suggested that none was developed in a manner such that it could meet these objectives. This result was probably to be expected, because no existing program had been developed with the aid of this set of well-defined, safety-oriented objectives.

F. Development of SPC

Because there was no driver education course available that appeared capable of attaining the instructional objectives, and because validated real-world performance measures seemed to be years off, it was decided to undertake a project to 1) develop specifications for a model HSDE curriculum, 2) construct the curriculum, 3) evaluate the extent to which it met the proposed instructional and performance objectives, and 4) conduct a controlled experimental evaluation of the model program in terms of its long-term crash reduction potential in a later demonstration project.

A contract was subsequently awarded in 1972 to HumRRO in conjunction with Central Missouri State University (121) that resulted in the development and pilot testing of SPC. The curriculum specifications for this program were developed from the instructional objectives available from earlier project efforts. Persons with expertise in the field of driver education developed specifications for each of eight units of instruction, including:

- *Unit One: Introduction*
  Intended to acquaint the student with the nature of instructional content and methodology
- *Unit Two: Basic Control Skills*
  Deals with fundamental skills required to control the motion of the automobile
- *Unit Three: Normal Driving Procedures*
  Deals with procedures required for operating an automobile safely within the highway transportation system
- *Unit Four: Environmental Factors*
  Deals with driving procedures to be applied under environmental conditions that tend to degrade driving safety
- *Unit Five: Complex Perceptual Skills*
  Directed toward the development of higher perceptual skills required for highly effective driving
- *Unit Six: Driver Influences*
  Concerned with the driver's readiness to cope with complex factors, such as fatigue and psychological and physiological conditions (including alcohol and drugs)
- *Unit Seven: Emergency Skills*
  Deals primarily with the complex manipulative skills required to handle an automobile in the event of an emergency
- *Unit Eight: Nonoperational Tasks*
  Concerned with a variety of activities required to support safe driving

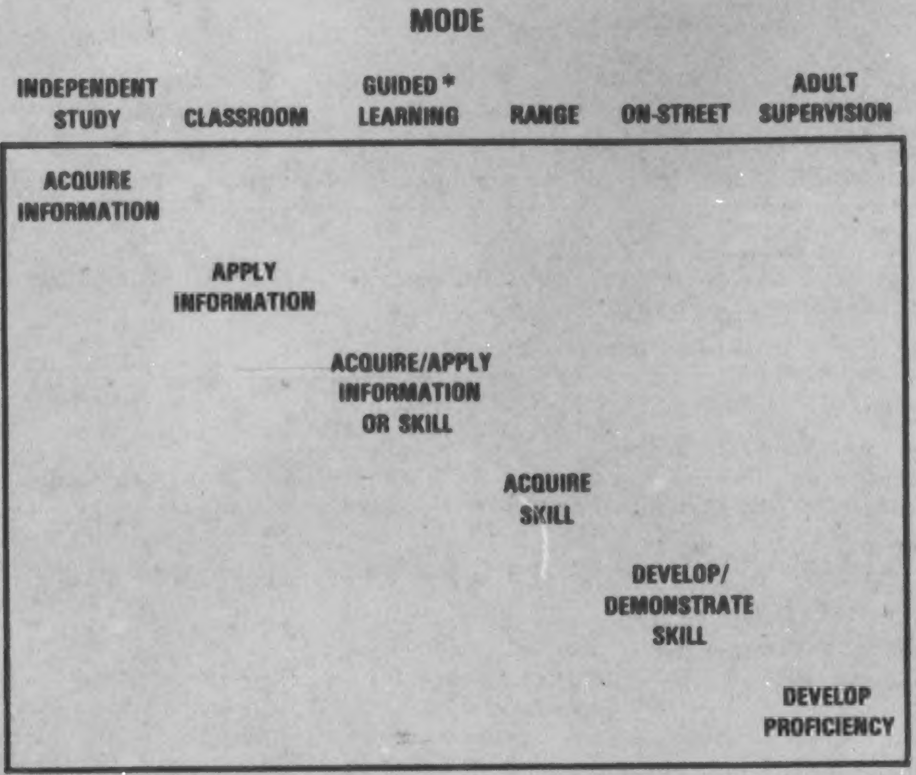
The specifications for these units of study did not attempt to define the *specific* characteristics of the required curriculum materials. Rather, they sought to identify what the materials must be capable of accomplishing; that is to say, the specifications defined the *functional* characteristics of the material. The specifications were then reviewed by approximately 50 driver educators and other interested parties.

The materials actually used in the development of SPC represent only one possible form the curriculum might take. Where existing materials were available and met the specifications, they were used. For the most part, however, new materials had to be developed, because the existing materials pursued objectives that were either irrelevant to SPC or approached the subject matter in ways that did not coincide with the instructional sequence outlined in the specifications. As designed, and in keeping with the current emphasis on multimodal programs, SPC was to be administered in six basic instructional modes, including 1) independent study, 2) classroom instruction, 3) guided learning, 4) multiple-car driving range, 5) on-street driving, and 6) adult supervision. Figure 15 shows the basic objectives of each instructional mode and the way in which they relate to one another.

The curriculum as developed required multimedia equipment, an automobile simulator, and a driving range. In addition to these equipment requirements, the curriculum specifies a student-teacher ratio of 30 to 1 for the classroom, 16 to 1 for simulator and range, and 3 to 1 for on-street training (per 55-minute session).

In addition to the instructional materials developed for SPC, intermediate criterion measures were developed to measure the achievement of the instructional objectives. They included the following:

- *Driving Knowledge Pre/Post Tests*—A 50-item test covering all units of instruction


MODE
INDEPENDENT STUDY
CLASSROOM
GUIDED * LEARNING
RANGE
ON-STREET
ADULT SUPERVISION
ACQUIRE INFORMATION
APPLY INFORMATION
ACQUIRE/APPLY INFORMATION OR SKILL
ACQUIRE SKILL
DEVELOP/ DEMONSTRATE SKILL
DEVELOP PROFICIENCY

*Guided learning may be used in any sequence throughout the course.

Figure 15

RELATIONSHIP BETWEEN VARIOUS MODES OF THE SPC CURRICULUM AND THEIR OBJECTIVES

- *Unit Knowledge Tests*—Tests designed to assess the student's mastery of information content in the learning activity packages
- *Basic Skills Range Test*—A performance test of the student's ability to control the longitudinal and lateral motion of the car and to execute simple maneuvers
- *Perceptual Skills Test*—A test in which the student responds to filmed moving situations requiring distance-time judgments and the identification of hazards
- *Evasive Range Test*—A performance test of the student's ability to perform extreme steering and braking procedures required in carrying out evasive maneuvers in response to simulated emergency situations
- *On-Road Performance Test*—A performance measure calling for observation and recording of student responses to a variety of commonly encountered highway and traffic situations
- *Attitude Measure*—A pseudofactual knowledge test, designed to reveal beliefs concerning issues of importance to driving safety

In addition to the SPC curriculum package, a minimal skills course called the Pre-Driver Licensing (PDL) course was also developed as a part of this contractual effort. The PDL was developed to provide a comparison curriculum for evaluating SPC and was aimed at developing only those knowledges and skills necessary for obtaining a driver's license. Table 9 provides a comparison of SPC and PDL in terms of curriculum units and instructional time.

Several documents have been completed that describe SPC, PDL, their development, and various guidance materials (122, 123, 124, 125, 126, 128). It should be noted that several different groups participated in the development and production of the various curriculum materials. For example, an advisory panel of safety education leaders and more than 100 driver educators across the country provided comments, questions, information or materials for the development process. In addition, organizations within the business community provided support for the development and production of various materials such as simulation and multimedia equipment and student materials.

G. A Pilot Test of SPC

The second phase of the SPC contract involved pilot testing the curriculum. Pilot testing began in June 1973 in the Kansas City, Missouri, school system. This location was selected for the test because driver education is not a State requirement in Missouri and had not been previously offered in the schools identified for participation. This choice enabled the curriculum to be introduced into the school's program in a systematic manner, thus permitting a random assignment design to be used with a minimum of ethical objections. It also required a higher implementation cost, because an entire program had to be established.

Students who volunteered* for the program were randomly assigned to 1) the SPC course, 2) the PDL course, or 3) no formal HSDE course. Thus, it would be possible to evaluate the SPC course against a minimal skills course and against no formal training. It is recognized that students assigned to the latter group would learn to drive from some source, such as parents, friends, or commercial driving schools, and that it would be difficult to determine how all the students in that group had learned to drive. It was felt, however, that a comparison of the SPC curriculum with both the minimum exposure (PDL) course and the no-treatment (control) group would provide some information concerning the effectiveness of a model HSDE course compared with all other sources of training and would be of potential use in interpreting cost-effectiveness issues. The comparison of

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*Volunteer bias (i.e., comparing subjects *who had volunteered* and completed an HSDE program with subjects *who had not volunteered* and had not been exposed to such a program) was the most common flaw in previous driver education evaluation studies. Unless volunteer bias is eliminated, the effects of factors that cause one subject to volunteer and another not to volunteer cannot be distinguished from the effects of the treatment. If volunteers are used for *both* experimental and control groups, however, as in this study, volunteer *bias* does not occur since the effects of these and other contaminating factors are distributed evenly among the groups.

Table 9

TIME SPENT IN INSTRUCTIONAL MODES, BY CURRICULUM UNITS

Safe Performance Curriculum (SPC)

INSTRUCTIONAL MODES / CURRICULUM UNITS	CLASSROOM	SIMULATOR	RANGE	ON-STREET
1 INTRODUCTION	3*	–	–	–
2 BASIC CONTROL TASKS	2	2	4+	–
3 NORMAL DRIVING	5	2	4	2
4 ENVIRONMENTAL FACTORS	3	1	1	–
5 COMPLEX PERCEP. SKILLS	7	1	1	3
6 DRIVER INFLUENCES	4	–	–	–
7 EMERGENCY SKILLS	2	1	4+	1
8 NON-OPERATIONAL TASKS	5	–	–	1**
	31	6	14	7

(Note: The student also spends 18 - 20 periods in Guided Learning sessions and one period on-street for "open practice.")

Pre-Driver Licensing Course (PDL)

1 INTRODUCTION	1	–	–	–
2 BASIC CONTROL TASKS	1	2	4+	–
3 NORMAL DRIVING	6	–	–	2
	8	2	4	2

(Note: PDL students also take the final on-road performance test.)

* Numbers show 55-minute periods.
** Represents final on-road performance test.
+ Includes range test.

the SPC students with the PDL students would indicate the effectiveness of the *safety content* of SPC and, to the extent that the PDL represents the minimal skills required for obtaining a driver's license, the effectiveness of a comprehensive HSDE program over the minimal skills preparation required by driver-licensing procedures. The SPC and PDL course effectiveness was to be measured in terms of short-term and intermediate criteria, such as the knowledge, attitude, and skills tests already described. In addition, all three groups (including the no-training control group) were to be evaluated in terms of their driving records (i.e., crashes and violations) after being licensed. This latter evaluation effort was not successful, however, because of 1) the large sample size requirement for obtaining statistical significance (now estimated at 3,000 *licensed* drivers per group), and 2) the large attrition rate resulting from student absences, dropouts, and a low rate of licensing after course completion.* The costs involved in administering the program to so large a group of people (approximately 6,000 in each of the three groups) were prohibitive for this pilot study. Therefore, this initial test of the SPC curriculum consisted entirely of the collection and analysis of short-term and intermediate measures taken on the SPC and PDL groups. These data were collected and carefully analyzed to determine any differences in performance between these two groups. Program effects were also analyzed in terms of scholastic achievement and sex. The results of the analyses, which included both the SPC and PDL groups, are shown in figure 16. As is apparent, the *posttests* for all four measures shown here (i.e., knowledge, basic skills range test, on-the-road performance test, and perceptual skills test) are higher than the *pretests* for the SPC students, indicating a positive change following exposure to the SPC course. Also the posttest scores for the SPC students are in every case higher than the posttest scores for the PDL students. Thus, on all four measures the SPC group appeared to do better than the PDL group. The differences, however, were not as great as had been expected. Nor could these differences have been taken as predictors of subsequent crash behavior because there is, as yet, no demonstrated relationship between such test measures and real-world driving performance.

The performance of the SPC group with regard to various units within SPC can be seen in figure 17. This figure shows the percent correct responses for various curriculum units. As can be seen, students averaged approximately 64 percent correct responses on these units. This performance level was much lower than expected. Scores on nonoperational skills, such as trip planning and handling breakdowns and crashes, were particularly low.

Thus, following the pilot-test effort, little more is known about the crash reduction effectiveness of the model curriculum than before the test. Although trends were consistently in the desired direction, it was apparent that improvements needed to be made in the administration of the curriculum.** It should also be pointed out that a number of difficulties arose during the pilot project, including maintenance of control over the random assignment procedure, delays in scheduling, inadequate instructor preparation, and administrative problems owing in part to the shared responsibility between the prime contractor and the subcontractor. These problems have been reviewed carefully and specific recommendations have been made to minimize such problems in any future evaluation of SPC.

H. Demonstration of SPC in Terms of Ultimate Criterion Measures

This brings us to the final phase of the development and evaluation of the SPC curriculum before NHTSA can decide whether SPC can be a cost-effective countermeasure for use by the States. It is expected that (unless there are no successful bidders) by the end of fiscal year 1976, NHTSA will have awarded a contract to conduct the long-term demonstration of SPC. An initial request for proposals to conduct this project has already been issued. Before an award of the

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*Only about 25 percent of those students who were included in the study were found to have a driver's license within 6 months following the course completion period.

**It should be duly noted that the ability to make such a statement, that the course needs improvement, derives specifically from information gained by means of the random assignment, comparison group design used in the pilot evaluation.

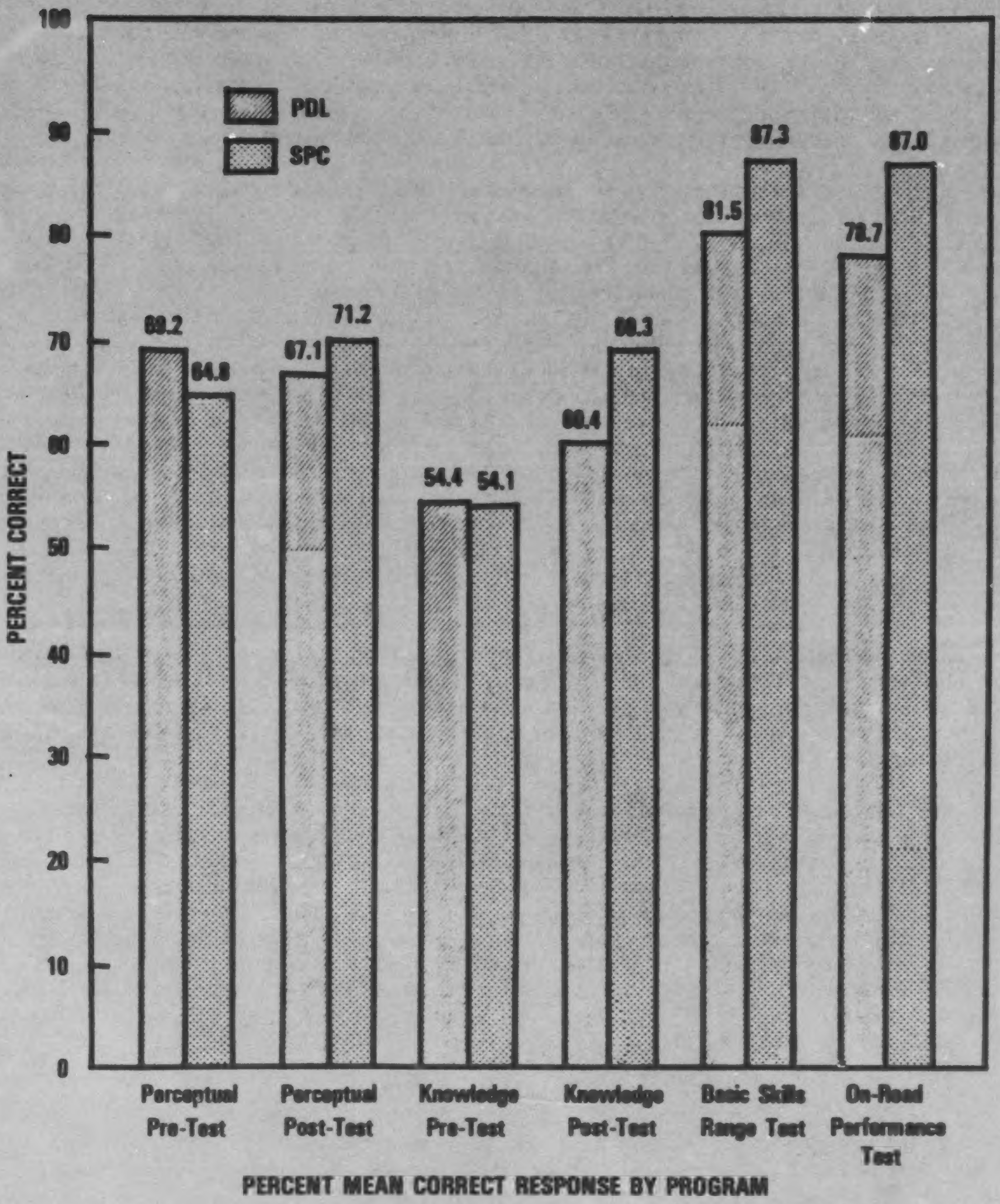


Figure 16

RESULTS OF THE ANALYSIS OF INTERMEDIATE PILOT-TEST MEASURES FOR THE SPC AND PDL CURRICULA

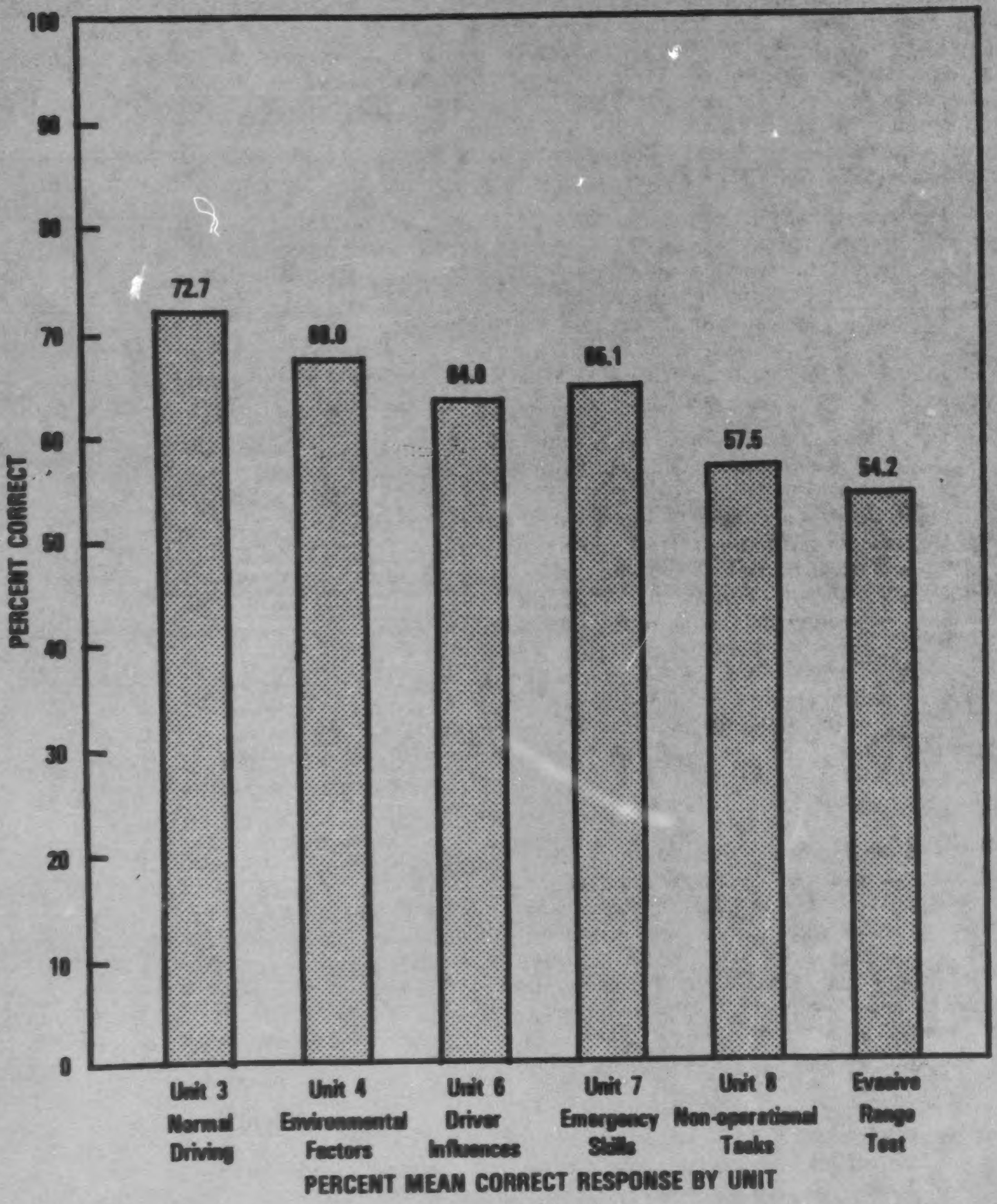


Figure 17

PERCENT CORRECT RESPONSES FOR VARIOUS CURRICULUM UNITS INCLUDED IN THE SPC PILOT EVALUATION contract is made, however, site visits will be conducted to proposed project locations to discuss evaluation and administration requirements. Initial briefings concerning these requirements have already been conducted in the NHTSA regions for potential bidders and at NHTSA's Washington headquarters for initial applicants. Every precaution is being taken to avoid the problems that have plagued previous HSDE evaluation projects, including the SPC pilot-test effort.

The primary *goal* of this project, which will require approximately 6 years to complete, is to determine the crash and violation reduction potential of the NHTSA-developed model driver education program (SPC). Specific *objectives* of the program include:

- Providing for an adequate evaluation of SPC using crash reduction criteria
- Confirming the effectiveness of SPC in terms of meeting its instructional objectives
- Confirming the reliability and validity of short-term performance measures
- Determining the administrative feasibility of SPC
- Providing information for the revision of SPC if necessary

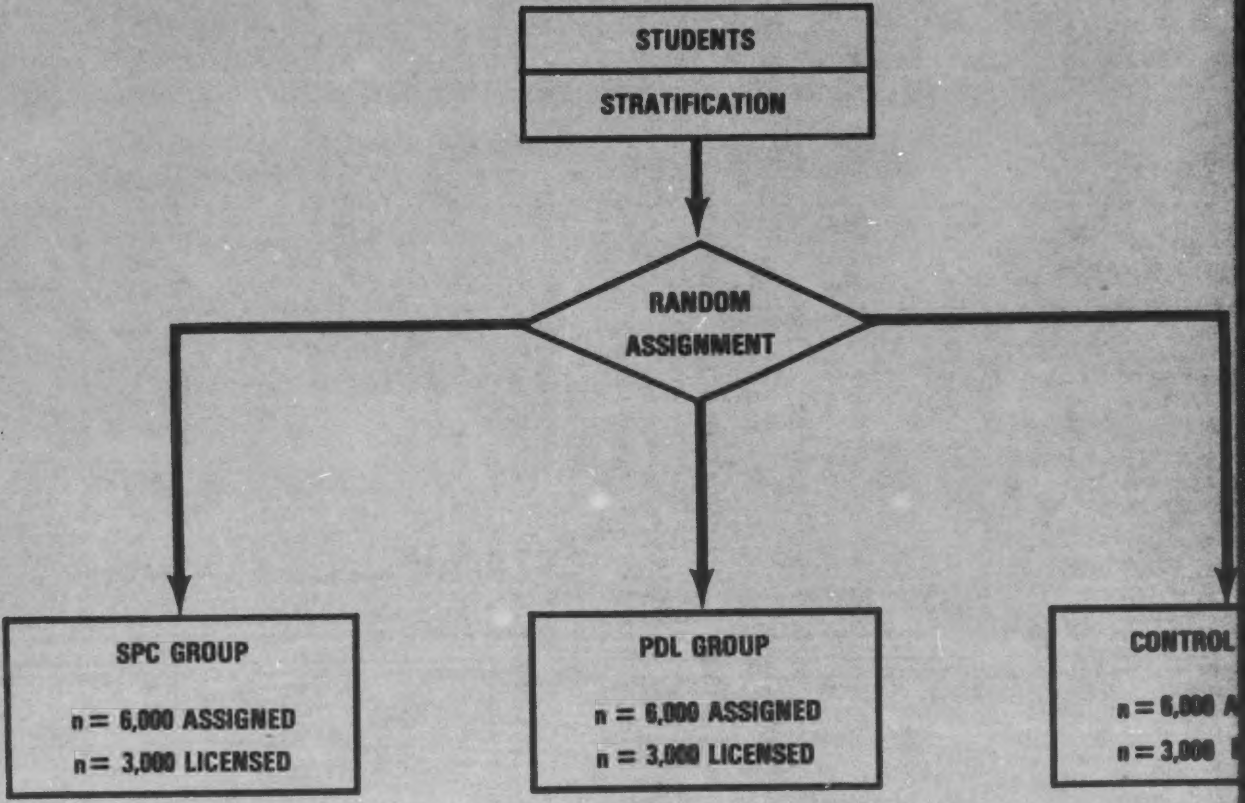
Put in terms of the questions that will be asked during the conduct of this study, we have the following:

- Do students taking SPC have better subsequent driving records than those taking PDL or those having no formal public instruction at all? (ultimate criteria)
- Do students completing instruction in SPC have higher grades on the in-course test measures than students completing PDL? (intermediate criteria)
- Do students performing better on in-course tests have better driving records for the first 2 years of driving than students who perform less well on such tests? (validity of the tests)
- Does SPC fit within the administrative, financial, and scheduling constraints of the secondary school program? (administrative feasibility)

To answer these questions, the experimental design shown in figure 18 will be used. Over a period of 24 months approximately 18,000 students at the project locations will be *randomly* assigned to one of three possible groups: 1) those receiving SPC, 2) those receiving PDL, and 3) those receiving no formal training. This design will result in 6,000 persons being initially assigned to each group, and an estimated 3,000 in each group who will actually complete each program assignment and become licensed drivers within 6 months.

Based on the California driver followup study (22) and its estimate that approximately 13 of every 100 new drivers will be involved in a reported crash within 12 months following licensing, it is expected that the 18,000-student sample size will be adequate to detect a resulting difference as low as 10 percent in subsequent crash rates among any of the three groups (e.g., a crash rate of 11.7 per 100 SPC students vs. a rate of 13 crashes per 100 PDL students, or a *difference* between the SPC and PDL groups of 1.3 crashes per 100 drivers). Records will be kept concerning whether the students are assigned to summer, fall, or winter groups, as well as on various demographic characteristics such as age, sex, socioeconomic status, and class standing. Final data analyses will take such variables into consideration.

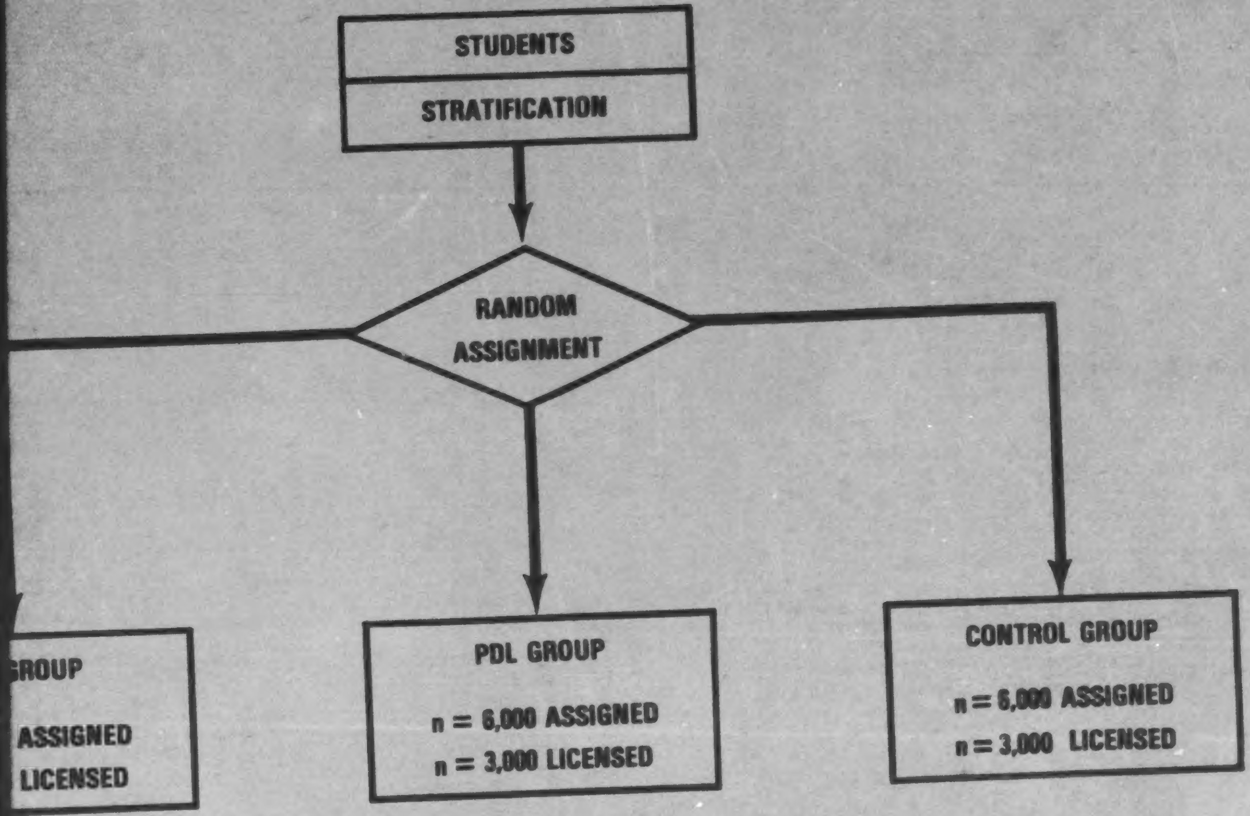
After being assigned to and completing the appropriate training condition, the SPC and PDL groups will be evaluated with regard to their scores on the *intermediate performance* measures (knowledges, attitudes, and skills). The *driving records* of all three groups will then be followed for a period of 2 years after completion of various training conditions. Because it is possible that fewer low-socioeconomic-level students in the no-education (control) group will receive their licenses within a 6-month period, this group may be biased with a greater proportion of *higher* socioeconomic-level licensed drivers to receive followup. Since it has been shown that socioeconomic status is related to the probability of subsequent crash involvement, this factor will be manipulated statistically in order not to bias the no-treatment group toward better performance. The evaluation requirements that must be met in order that the contract be awarded are as follows:


STUDENTS
STRATIFICATION
RANDOM ASSIGNMENT
SPC GROUP
n = 6,000 ASSIGNED
n = 3,000 LICENSED
PDL GROUP
n = 6,000 ASSIGNED
n = 3,000 LICENSED
CONTROL
n = 6,000
n = 3,000

- PERFORMANCE MEASURES ANALYZED IMMEDIATELY
- DRIVER RECORDS KEPT AND ANALYZED FOR 2 YEARS

Figure 18

EXPERIMENTAL DESIGN FOR THE DEMONSTRATION OF THE SPC CURRICULUM


STUDENTS
STRATIFICATION
RANDOM ASSIGNMENT
GROUP
ASSIGNED
LICENSED
PDL GROUP
n = 6,000 ASSIGNED
n = 3,000 LICENSED
CONTROL GROUP
n = 6,000 ASSIGNED
n = 3,000 LICENSED

- PERFORMANCE MEASURES ANALYZED IMMEDIATELY
- DRIVER RECORDS KEPT AND ANALYZED FOR 2 YEARS

Figure 18

EXPERIMENTAL DESIGN FOR THE DEMONSTRATION OF THE SPC CURRICULUM

- Evidence must be provided to support the availability of a sufficient number of potential students to meet the sample size requirements.
- Evidence must be provided to insure the capability of randomly assigning the students to the various groups *including* the no-education control group.
- Evidence must be provided to insure an adequate State records system with regard to the timely entry and accessibility of crash and violation data.

If successfully carried out, this demonstration project should provide the first adequate evaluation of a secondary school driver education curriculum to date. If not, it should at least provide a model for future evaluation efforts and subsequent HSDE program improvements.

I. The Potential Impact of the SPC Program in Reducing Crashes

Although difficult, it is theoretically possible for NHTSA to estimate the number of lives saved by a *single*, well-designed administration of a program (e.g., the SPC demonstration project). This estimate can be made by comparing the subsequent crash rates of those who were exposed to the program with the rates of those who were not. In such a case, significant factors such as the number of persons exposed to the program and the quality of the program are under the agency's direct control. In estimating the impact of a *nationally* implemented program, however, these variables are not under the direct control of NHTSA. For example:

- The States and localities will determine how many persons will be exposed to any one particular program.
- The States and localities will determine the quality of the program's administration and, thus, its potential effectiveness.

Thus, to make an estimate of the impact that a nationally implemented program such as SPC might have in reducing total crashes, a model is required and an estimate must be made of some of the *parameters* of that model. Some of the questions that need to be answered to determine overall crash impact are shown in figure 19, and include the following:*

- What is the effectiveness of the program in terms of crash reduction? (E.g., is the program at least 15 percent effective, in that young drivers exposed to the program have 15 percent fewer subsequent crashes than those not exposed to it? This can be determined in a demonstration program such as the one being implemented.)
- How many students will complete the program? (E.g., can 73 percent of all eligible students (2,600,000) be exposed to the program nationally?)
- How uniform is the quality of the administration of the program? (E.g., can all States and localities administer the program uniformly according to the guidelines provided?)
- How many newly licensed drivers have to be exposed to the program for every one who will be involved in a crash in the first year of driving? (E.g., approximately one of every four newly licensed drivers will be involved in a crash in the first year of driving. Therefore, four new drivers must be exposed to the program for every one crash to be potentially affected.)

At this point, if all the estimates are reasonably accurate,** it is possible to estimate the crash reduction impact of the program. For example, if 2,600,000 students were annually exposed to a uniformly effective SPC program, if that program has been shown to have a crash reduction

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*The following exercise is intended only to estimate potential overall impact of any uniformly effective program. There are no plans to implement SPC nationally. However, the cost-effectiveness estimates should be appropriate for wherever such a program would be implemented.

**Although the estimates of "15 percent program effectiveness" and "4 drivers for every one involved in a crash" are quite reasonable, the expectation that all 2,600,000 students presently eligible for HSDE each year could be exposed to an SPC program of uniform effectiveness is not very reasonable. Yet impact should be proportional to the number of persons who are exposed to the uniformly administered program and, thus, the approach seems valid. The one variable which would be difficult to estimate from site to site is the uniformity and quality of the program administration and, thus, its potential effectiveness.

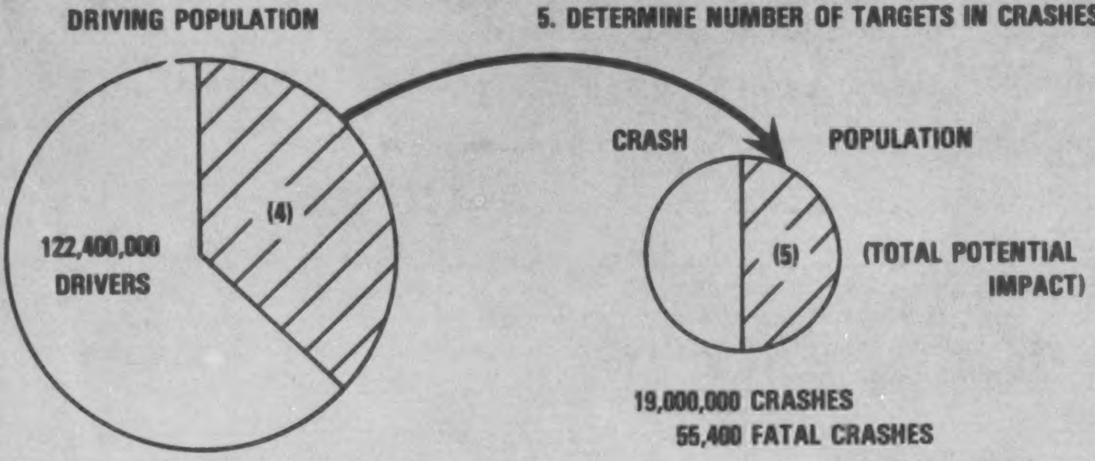
1. IDENTIFY TARGET GROUP

2. ESTIMATE PROGRAM CRASH REDUCTION POTENTIAL (CONTROLLED STUDIES)

3. ESTIMATE NUMBER OF TARGETS TO BE EXPOSED

4. DETERMINE NUMBER OF TARGETS IN DRIVING POPULATION

5. DETERMINE NUMBER OF TARGETS IN CRASHES


DRIVING POPULATION
(4)
122,400,000
DRIVERS
CRASH
POPULATION
(5)
(TOTAL POTENTIAL
IMPACT)
19,000,000 CRASHES
55,400 FATAL CRASHES

6. DETERMINE NUMBER OF TARGETS PER CRASH $\left[(4) \div (5)\right]$

7. ASSESS IMPACT $= \dfrac{\text{TOTAL EXPOSED (3)}}{\text{NUMBER PER CRASH (6)}} \times$ **PROGRAM EFFECT (2)**

Figure 19

MODEL FOR ESTIMATING PROGRAM IMPACT

potential of 15 percent, and if there are four newly licensed drivers for every one who will be involved in a crash in the subsequent 12-month period, then a savings of 97,500 crashes could be effected.

number of students exposed to program

crashes avoided

(A)* $$\frac{2,600,000}{4} \times .15 = 97,500$$

number of drivers for each one to be involved in a crash in 12-month period

program effectiveness in reducing crashes

A savings of 97,500 crashes represents an overall crash reduction of approximately 0.5 percent and a dollar savings of approximately $390 million, if NHTSA cost estimates of $4,000 per average crash are accurate.

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*All numbers represent estimates.

(B)* $$\frac{\text{97,500 crashes avoided per year}}{\text{19,000,000 crashes per year}} = .005 = .5\% \text{ (impact)}$$

(C)* 97,500 × $4,000 = $390,000,000 (dollars saved)

In terms of cost effectiveness, such an effort would probably pay for itself in terms of 1 year's crash reduction alone. For example, NHTSA estimates that 1) the average crash costs $4,000 and 2) the cost of administering SPC is approximately $90 per student. If we considered the latter estimate as high as $100 per student, the amount of dollars saved could be estimated as follows:

(D) 97,500 crashes × $4,000 per crash = $390 million

(E) 2,600,000 students × $100 per student = $260 million

(F) $390 million saved - $260 million cost = $130 million net

Thus, the estimated savings resulting from administering a 15-percent effective HSDE program to 2,600,000 students would be approximately $130 million dollars, or $1.50 returned for every dollar invested over a 1-year period. This estimate does not include benefits in subsequent years (i.e., crash reductions) from the same training experience, or whatever benefit society receives from the training service provided by public school driver education programs.

This exercise was not intended to mislead the reader into thinking that HSDE is now paying its way in terms of highway safety criteria. Certainly, much work would have to be done to insure the uniform implementation of a known effective program (or a series of such programs) to such a large number of students. This exercise *is* attempting, however, to put the *potential* impact of such an HSDE program into a proper context. A 15-percent effective HSDE program *will not* result in a 15-percent reduction in annual crashes. More likely it would result in a reduction of less than 1 percent (per year). Yet, such a reduction would be more than cost effective, not even considering the additional benefits discussed in the proceding paragraph. Furthermore, while the total potential impact on national crashes depends upon how extensive a program is implemented, cost effectiveness does not.** Cost effectiveness depends only upon the quality with which the program (SPC or any other HSDE program of demonstrated effectiveness) is implemented. What is the estimated cost effectiveness of other traffic safety countermeasures? Is there another countermeasure of greater demonstrated effectiveness whose implementation will be hindered by continuing efforts in the HSDE area? These are questions that need to be addressed by traffic safety program administrators in deciding the worth and future of HSDE efforts.

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*All numbers represent estimates.

**The reason why a 15% effective program for young drivers will not result in a 15% reduction in total crashes is because all the target groups that contribute to total crashes will not be exposed to the young driver program (HSDE).

Section Eight

NHTSA EFFORTS IN OTHER DRIVER EDUCATION AREAS

A. Past and Present Research and Development Projects

Young Driver Programs

Several research efforts are underway at present to examine the potential of various innovative techniques for contributing to the effectiveness of High School Driver Education (HSDE). For example, as a result of the frequently voiced concern that the in-car (behind-the-wheel (BTW)) phase of HSDE is not sufficiently long to develop the skills/habits necessary for safe driving, the National Highway Traffic Safety Administration (NHTSA) is investigating the potential for *parent participation* in this phase of the program.

Guidelines for parent participation are at present being developed that should provide for close, organized parental supervision of the learner over an extended period of time. This approach has the added advantage of possibly teaching parents improved safety practices. This program approach is presently being pilot tested in both inner city and suburban areas. If parents use the program, and if the students in the program learn more than their matched controls, the program will be incorporated into future revisions of the Safe Performance Curriculum (SPC).

Another significant problem involved in in-car instruction is the provision of relevant, visual scenes (e.g., semiemergency situations) for training. Advances in technological areas, such as *holography*, may permit the presentation of such visual stimuli for either instructional or evaluation purposes.

Some potential problems involved in this area will include initial high costs and instructor training in the use of the new device. In addition, it must be recognized that the contemplation of such advanced uses for this technique is surely pushing the state of the art in this area. Consequently, at present, NHTSA does not have a good feel for the probable success of this approach. It is felt, however, that holography has the potential for providing a marked advancement in driver training.

Extensive work is also being done in the area of vision testing and the exploration of techniques for developing improved *peripheral vision* scanning skills. Research in driver-licensing has indicated that effective peripheral vision may be an important factor contributing to safe-driving capability. The visual techniques investigated in this study emphasize various dynamic perceptual skills that show promise for improvement by training. They involve the ability to make constant and direct use of information from the peripheral field of view without directing the eyes at the particular object or event. One example of the use of this skill might involve the ability of a driver to perceive accurately the direction and rate of movement of a vehicle in the periphery, while keeping his eyes focused on the car or road sign directly in front of him.

Training techniques that prove to be effective and useful in improving peripheral visual skills will be incorporated into future driver education and improvement programs. In fact, it is expected that several products from the above innovative research and development efforts will be available for the initiation of an innovative procedures demonstration project in fiscal year 1977 or 1978.

Young Handicapped Drivers

One result of the Kansas City pilot test of SPC was the finding that culturally deprived youth had difficulty in using some of the instructional materials. Since there have been some indications that such persons are proportionately overinvolved in crashes, this finding was taken to be potentially important. Subsequently, a study was undertaken in cooperation with the Department of Health, Education, and Welfare's (HEW) Bureau for the Education of the Handicapped (BEH) to determine *driver-training* and *licensing* requirements for various *special populations.* Some of the special groups that will be looked at include school dropouts and learning-disabled, physically handicapped, mentally retarded, hearing-impaired, and visually impaired persons.

This study will look at the specific learning capabilities and limitations for each of these special populations. It will survey various State requirements for licensing such persons and the appropriateness of existing safety education materials and training techniques for the various groups. The study will also attempt to assess the need for, and the probability of, providing mobility for each of the groups. Based on the results of the study, which should be available early in fiscal year 1977, instructional materials will be developed and tested, under controlled conditions, to determine the degree to which the various groups can be taught safe-driving practices. These materials should be available for large-scale demonstration in the near future.

The BEH may have some additional uses for these techniques. The driver-training program that is developed could possibly be used as a motivating device to learn other skills. For example, a slow reader or illiterate person may be motivated to learn to read well enough to pass the licensing examination, and these reading skills could then be expanded to other areas of development.

Adult Driver Education

A distinct but related area of driver education involves the training of already-licensed drivers to improve their skills. There are a variety of such programs. Most, like the National Safety Council's Defensive Driving Course, involve classroom instruction only, and some, such as General Motors' Advanced Training Program, involve instruction on a driving range in accident avoidance skills.

The NHTSA has been involved in a project with the U.S. Air Force to develop a multimedia safety education course, for use by licensed drivers, in both military and nonmilitary settings. The program that has developed from these efforts is a 10-unit course entitled "Survival in the Traffic Jungle." A brief description of each of the units is as follows:

1. *The Problem and a Logical Approach (including pretest)* provides introduction to the total program, breaks the driving process into four categories–*T*ask, *E*nvironment, *A*uto, and *M*an–and discusses the TEAM matrix.
2. *The Environment (Part I)* identifies environmental characteristics as being fixed or transient and discusses the need to identify and adjust to varying environmental conditions.
3. *The Environment (Part II)* discusses reactions to different situations and the need to interact with one another in such manner so as to minimize hazardous situations.
4. *The Auto* addresses vehicle condition and its relationship to the maintenance of control, and how to compensate for various performance limitations of a vehicle.
5. *The Man (Part I)* informs the student how the mental and physical condition of the driver and the visual limitations of the vehicle offset the maintaining of control.
6. *The Man (Part II)* has the purpose of informing students how the mental and physical condition of the driver is affected by the amount and type of drugs in his system, and how his vision, reactions, and vehicle control are limited.
7. *The Task* discusses how the various factors of the TEAM matrix interact and affect the accomplishment of the driving task.

8. *Driver Errors* identifies driver errors as being the single most important aspect of crash causation and discusses the five most critical driver errors: failure to yield the right-of-way, improper speed, improper passing, improper lane change, and following too closely.
9. *Emergency Situations* discusses how to plan for and perform necessary evasive and preventive maneuvers during major kinds of emergency situations.
10. *The Mature Traffic Citizen (including posttest)* discusses the requirements of a mature traffic citizen.

An earlier version of this program was pilot tested with U.S. Coast Guard recruits at Cape May, New Jersey. This project, called the Driver Improvement Training and Evaluation Study, was undertaken by the American University under contract with NHTSA (145). Recruits were matched on the basis of selected variables such as age, possession of a driver's license, prior driver education, and number of accidents. They were then randomly assigned to experimental and control groups. There were three separate experimental groups: those receiving both *classroom* and *range* instruction, those receiving *classroom* training only, and those who received *range* training only. Classroom training involved about 16 hours of preprogramed multimedia presentation, while range training involved about 14 hours of simple traffic mix exercises, basic skill exercises, and evasion and complex skills exercises. Each experimental group had its own control group.

At the beginning of the eighth week of recruit training, the experimental and control groups were *pretested* with a driver *knowledge* test and a BTW *driving-range* test. Program participation lasted for 1 week, and both groups were *posttested* with the above two tests plus a driving-related attitude inventory. A number of followup data instruments were used to obtain information about both experimental and control subjects after they left Cape May. These included a driving-behavior questionnaire, a week's trip diary, and a variety of questionnaires to collect exposure, violation, and accident data. The following results were reported:

- There were no significant differences between any of the training groups and their controls on pretest scores.
- Posttest scores indicated that the training groups performed better on the knowledge and driving-range tests then did their respective controls.
- Based on the questionnaire analyses, the classroom-plus-range and range-only groups did better than their controls on a number of reported driving behaviors.

Comparisons were also made between the training groups and their respective controls with regard to a number of crash and violation criteria. The results of these analyses were as follows:

- The only statistically significant difference in violations found between training and control groups was that the classroom-only group had fewer violations than its control group.
- Training groups had consistently smaller average crash rates than their controls, but most such differences were not statistically significant.
- The classroom-plus-range group had significantly fewer injury crashes than its control group (the control group had 2.67 times as many injury crashes).
- The classroom-only group had a lower percentage of injury crashes than its control group, but the difference was not statistically significant.
- The range-only group had a higher percentage of injury crashes than its control group, but the difference also was not statistically significant.

The data collected in this study were voluminous, and further analyses are now being conducted in a followup project (146). Because of the results regarding the range-only group, research is also being conducted to define more clearly the skills required for accident avoidance (emergency training). This project is described more completely below.

All in all, it was felt that the results of this initial test suggested a good potential for payoff in this area. This potential will be examined further in a demonstration program now being initiated. This demonstration program will attempt to assess the crash reduction potential of a similar classroom multimedia program with a group of young "problem" and "near-problem" drivers. In this project, entitled "Young Driver Improvement Program" (147), young problem and near-problem drivers, identified as such by State motor vehicle department records, will be randomly assigned to receive, or not to receive, exposure to the multimedia program. Driving records will be monitored for both groups for a period of 2 years to determine any violation or crash reduction effect that the program may have had. Figure 20 illustrates the experimental design of this demonstration project.

As a result of the findings of the Coast Guard study, another NHTSA research project was initiated in mid-1974 to investigate the feasibility and potential effectiveness of *advanced-training* programs aimed at developing emergency skills (148). Such skills would be designed to aid recovering from emergency situations and reducing the severity of crashes. There are two phases to this program, each with different objectives, as follows:

- Phase I: Problem Analysis Phase
  - Analyze the events immediately preceding various crashes.
  - Derive a minimal number of behavioral requirements for possible crash avoidance.
- Phase II: Training Program Development Phase
  - Identify and develop the techniques for training and testing.
  - Determine feasibility and costs of training persons.
  - Develop experimental plan to evaluate the training program.

The first phase of this project has been completed and has revealed that:

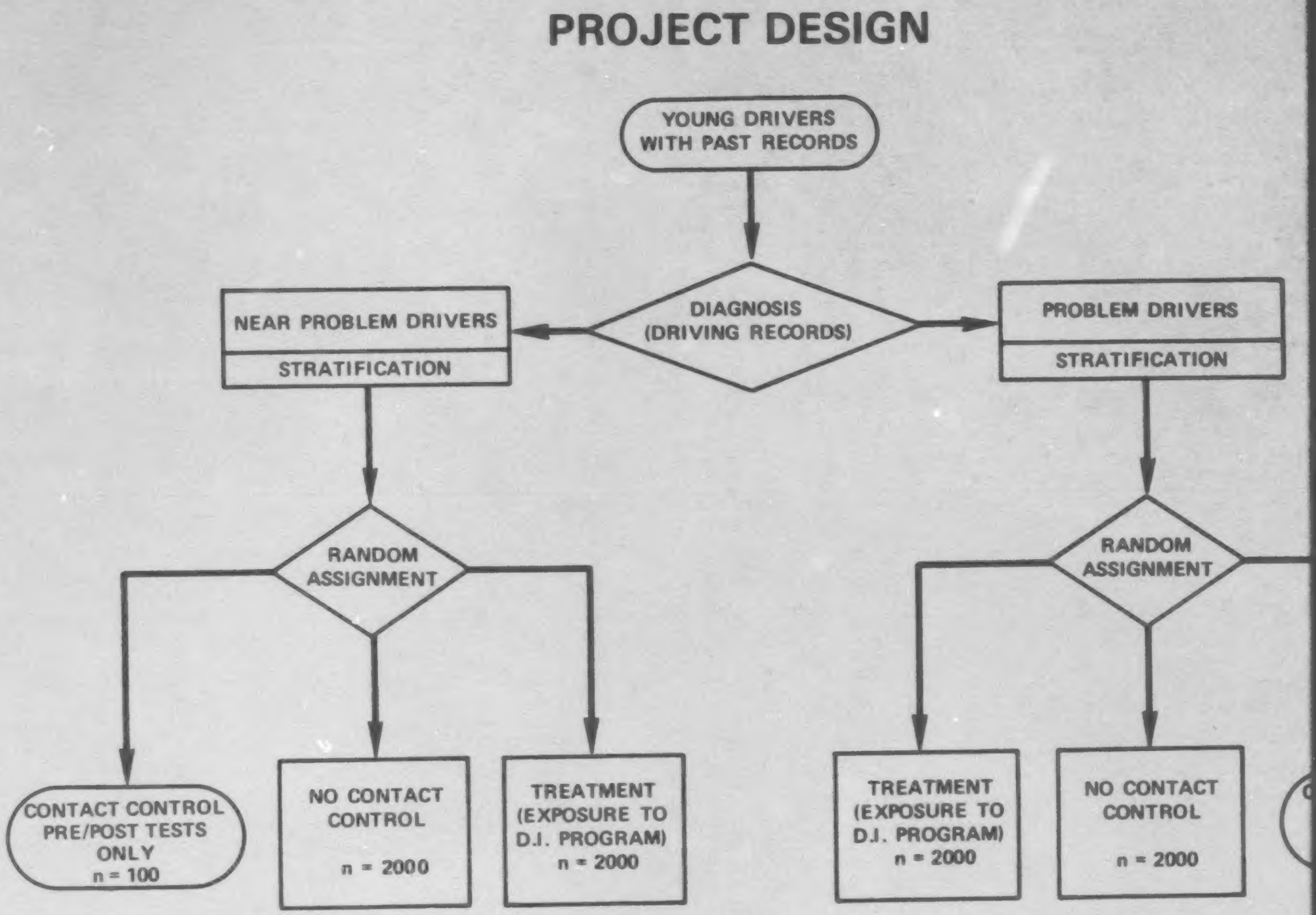
- In the case of the two-vehicle crashes studied, approximately 30 percent could have been avoided or their severity reduced had the driver executed an appropriate recovery maneuver.
- The remaining 70 percent of two-vehicle crashes were determined to be unavoidable in that the drivers either 1) did not recognize the impending crash situation in time to avoid it or 2) there was no escape route available.

This information, along with information on the driver errors and recovery options related to different types of emergencies, will be used in the second phase to structure and develop an advanced form of training not now generally available to the motoring public.

Motorcycle Driver Education

In motorcycle driver education, a number of research projects have been and are now being undertaken. Chronologically, the major NHTSA projects in this area include:

- The 1968 Reiss and Haley study (98), which concluded that licensing and education programs offered the highest payoff for reducing motorcycle crashes
- A 1973 analysis of 5,600 motorcycle crashes in Michigan and Illinois (149), which found that 25 percent of the crash-involved drivers had less than 6 months of experience, and more than 50 percent had less than 1 year of experience
- The NHTSA's close work with the Motorcycle Safety Foundation during 1972-74 in the development of the motorcycle task analysis project and the development of curriculum and performance objectives
- A 1975 contract awarded to develop specifications for the development of a motorcycle safety education curriculum
- A 1975 contract awarded for the development of a motorcycle-licensing handbook

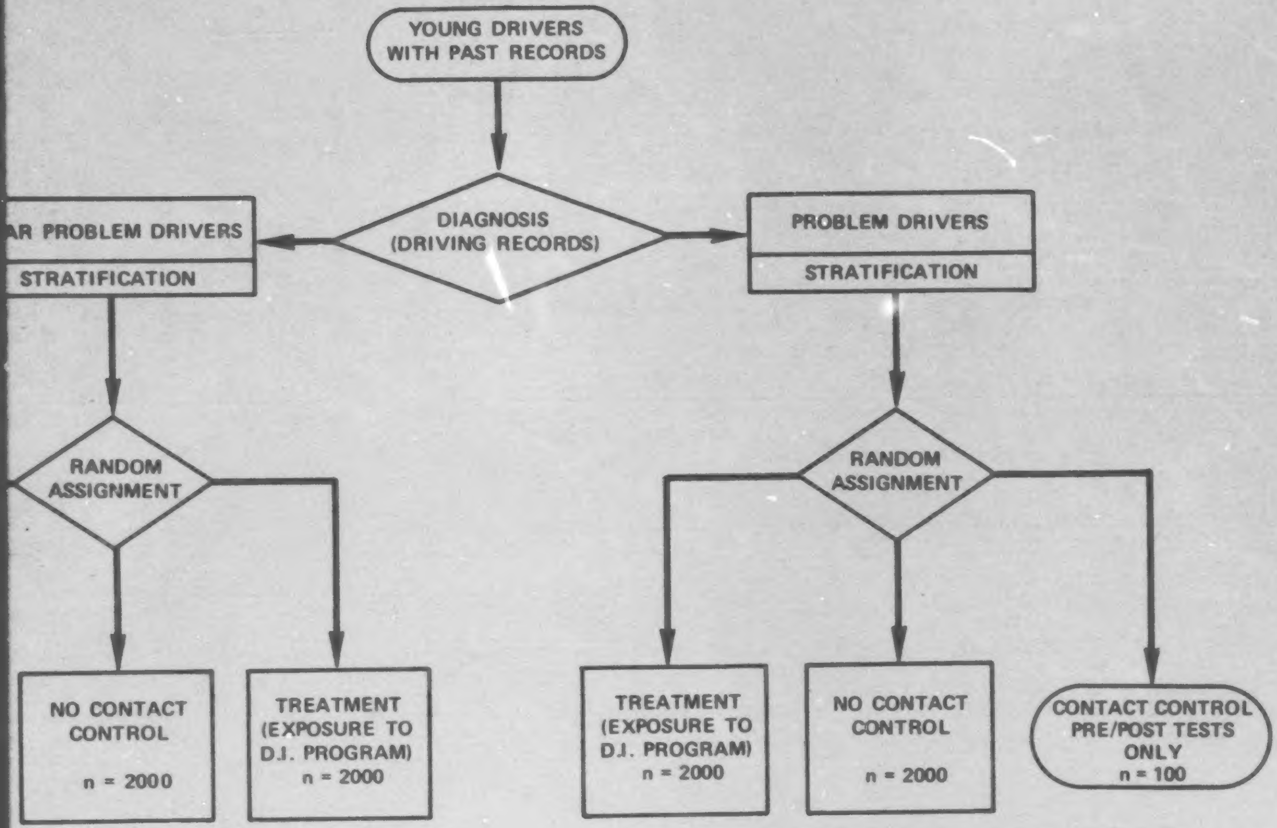

PROJECT DESIGN
YOUNG DRIVERS WITH PAST RECORDS
DIAGNOSIS (DRIVING RECORDS)
NEAR PROBLEM DRIVERS
STRATIFICATION
PROBLEM DRIVERS
STRATIFICATION
RANDOM ASSIGNMENT
RANDOM ASSIGNMENT
CONTACT CONTROL PRE/POST TESTS ONLY n = 100
NO CONTACT CONTROL n = 2000
TREATMENT (EXPOSURE TO D.I. PROGRAM) n = 2000
TREATMENT (EXPOSURE TO D.I. PROGRAM) n = 2000
NO CONTACT CONTROL n = 2000

- DRIVING RECORDS FOLLOWED FOR 2 YEARS (FOR EXPERIMENTAL AND CONTROL GROUPS)

Figure 20

EXPERIMENTAL DESIGN FOR THE YOUNG PROBLEM DRIVER DEMONSTRATION PROJECT

PROJECT DESIGN


YOUNG DRIVERS WITH PAST RECORDS
DIAGNOSIS (DRIVING RECORDS)
AR PROBLEM DRIVERS
STRATIFICATION
PROBLEM DRIVERS
STRATIFICATION
RANDOM ASSIGNMENT
RANDOM ASSIGNMENT
NO CONTACT CONTROL n = 2000
TREATMENT (EXPOSURE TO D.I. PROGRAM) n = 2000
TREATMENT (EXPOSURE TO D.I. PROGRAM) n = 2000
NO CONTACT CONTROL n = 2000
CONTACT CONTROL PRE/POST TESTS ONLY n = 100

IVING RECORDS FOLLOWED FOR 2 YEARS
R EXPERIMENTAL AND CONTROL GROUPS)

Figure 20

EXPERIMENTAL DESIGN FOR THE YOUNG PROBLEM DRIVER DEMONSTRATION PROJECT

In 1975, a demonstration project was also initiated to evaluate the crash reduction potential of an improved motorcycle-licensing program. The program, entitled "The Improved Motorcycle Driver Licensing and Training Project," is designed to determine whether persons who are required to pass more rigorous motorcycle-licensing tests have fewer subsequent crashes than those taking normal licensing exams. The cost effectiveness of such procedures will also be examined.

Alcohol-Related Educational Programs

There are primarily two different types of target groups for which alcohol-related education programs are being developed and evaluated by NHTSA. The first primary target group involves young beginning drivers in secondary schools. Here alcohol-oriented components are being developed for overall high school curricula, as well as for specific driver education programs within such curricula. Since these projects have only recently been undertaken, there are no adequate evaluations of them to date. The second primary target group for alcohol education curricula involves drivers who have been convicted of driving while intoxicated (DWI). As already mentioned in section six of this report, these programs began around 1967 with the advent of the Phoenix DWI Program. To date, NHTSA's primary effort in this area has been in conjunction with its comprehensive alcohol countermeasures program implemented in 1970. An alcohol education school was developed and used by each of the 35 Alcohol Safety Action Projects (ASAP's) that were initiated as a part of this program. There were many differences in the scope and content of these schools from one site to another. While some ASAP's had only one school to which a variety of drinker types were referred, others had separate schools for the different drinker types (e.g., social vs. problem drinkers). One particular project had as many as four different schools, each devoted to a different type of offender. Most of these schools were developed independently of one another at each site, and none benefited from an objective-based curriculum development process such as that used for the development of SPC.

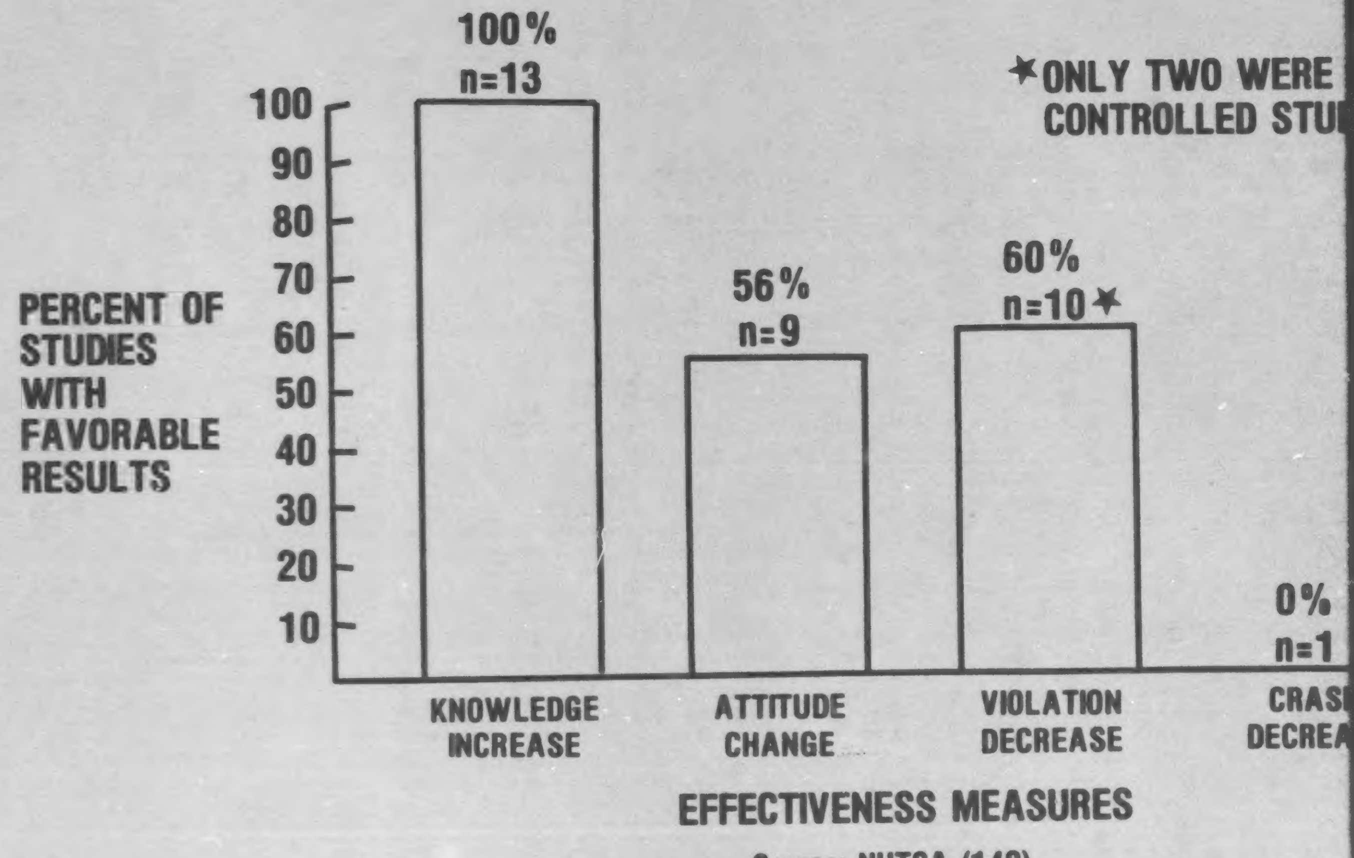
Since 1972, however, as many as 50,000 persons have been processed annually through such schools, and there have been a number of studies conducted to evaluate the schools' effectiveness. At the individual project level, for example, NHTSA set guidelines for each ASAP to conduct an evaluation of its alcohol education school. The first summary of such studies was reported in the 1974 annual report of the Alcohol Countermeasures Programs (140). As figure 21 indicates, these analytic studies included several criterion measures of effectiveness, such as attitude and knowledge level changes, violations, and crash reductions (in one study).

The evidence provided by these studies with regard to *increases* in *knowledge* level as a result of exposure to the various schools was quite consistent. In the area of positive *attitude* changes, however, the data were less convincing, and in the area of *crash reduction* evidence was nonexistent. At first glance, it appeared that many schools were effective in *reducing* subsequent alcohol-related *violations.*

As figure 21 indicates, 6 of the 10 studies that examined arrest recidivism reported results favoring the educational program. On close inspection, however, only two studies used randomly assigned control groups. Of these studies, one showed significant favorable results for the school group and the other failed to find any significant differences between the school and control groups (140).

Three additional studies included control and experimental groups that were matched on at least one variable related to recidivism. Of these three studies, only one reported significant results favoring the education group. In general, as the amount of control decreased, the number of studies reporting favorable results increased.

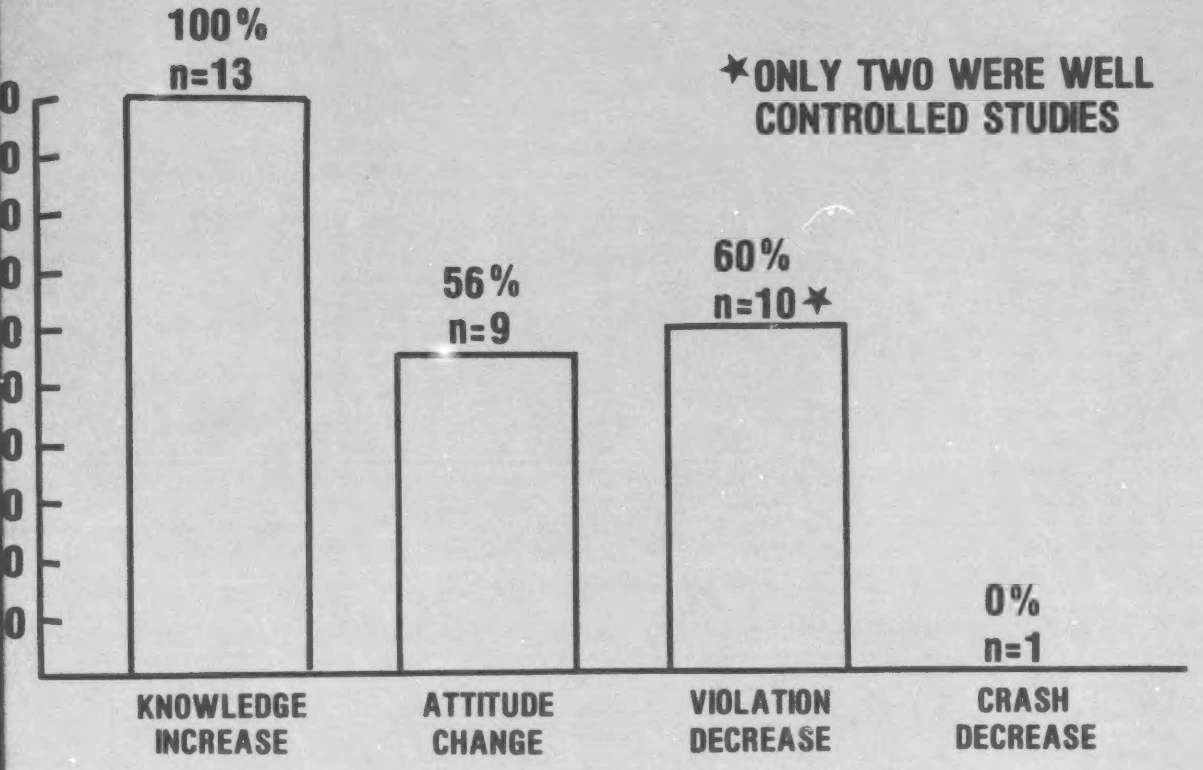
Analyses of the following year's efforts showed only an increase in the number of controlled studies reporting positive attitude changes for the alcohol education groups. There were no additional data to support the position that alcohol safety schools were effective in reducing crashes



Source: NHTSA (140)

Figure 21

RESULTS OF ANALYTIC STUDIES OF THE EFFECTIVENESS OF ALCOHOL SAFETY SCHOOLS



EFFECTIVENESS MEASURES

Source: NHTSA (140)

Figure 21

TS OF ANALYTIC STUDIES OF THE EFFECTIVENESS OF ALCOHOL SAFETY SCHOOLS among those persons exposed to them. However, one of the problems inherent in most of these analytic studies was that the sample size was sufficient to detect only large crash reductions.

In order to overcome the foregoing sample size problem, an overall *program level comparison* of the ASAP alcohol education schools was conducted and reported by Nichols and Reis (142). In this study, alcohol rearrest data were collected on persons entering 44 alcohol education schools at 29 ASAP's for calendar year 1973. In addition, site visits were made to each ASAP to obtain descriptive structural data to describe the educational programs at each site. The type of data collected included:

- The proportion of program time spent lecturing
- The amount of time spent on leader-client verbal interaction
- The amount of time spent on client-client verbal interaction
- Total program exposure time
- Average session size

On the basis of factor and cluster analyses conducted on the above descriptive data for each of the 44 schools, three different types of schools were derived, the characteristics of which are shown in table 10. These schools can be described as ranging on a continuum from the most extreme lecture-oriented schools to the most group-participation-oriented schools.

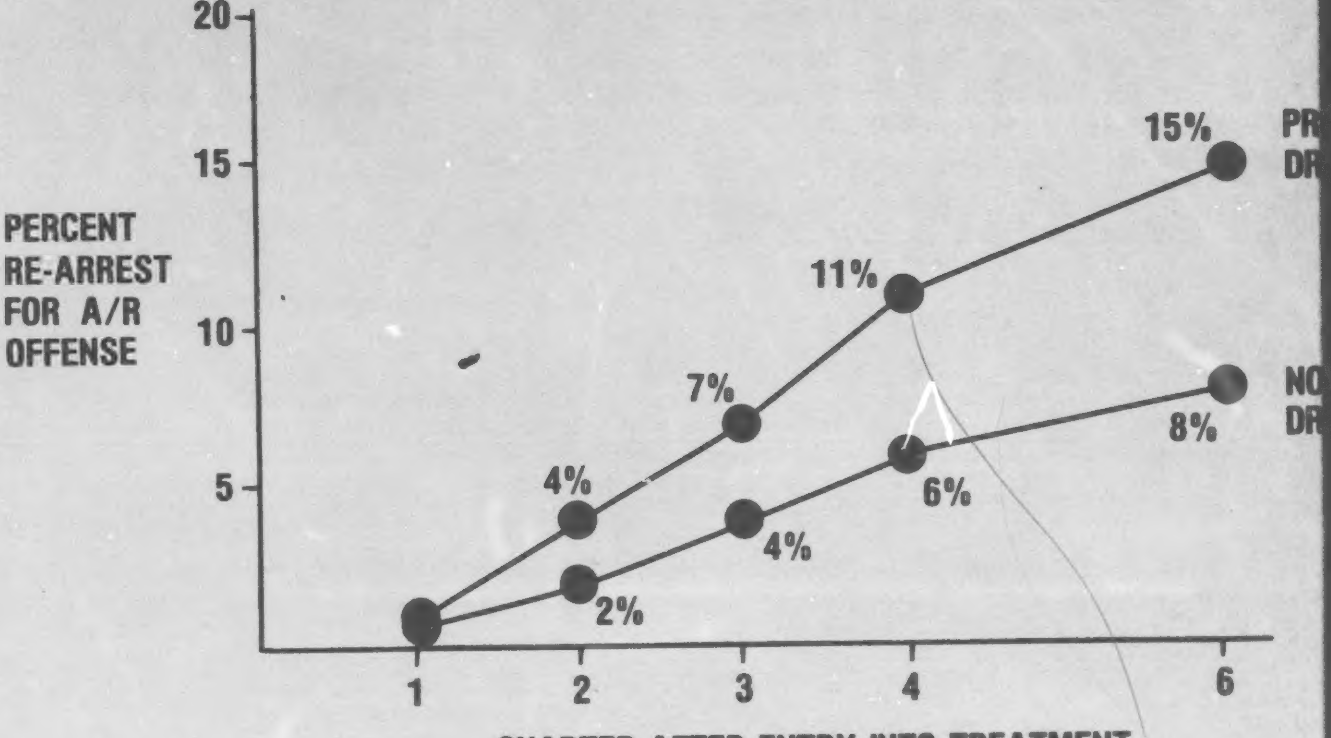
The next logical step in the process involved an analysis of quarterly recidivism rates (rearrest for an alcohol-related driving offense) for each school type. First, however, an analysis of the quarterly recidivism rates for those clients classified as problem and nonproblem drinkers was

Table 10

CHARACTERISTICS OF ALCOHOL EDUCATION SCHOOL TYPES

VARIABLES	SCHOOL TYPES		
	Type 3	Type2	Type1
INFORMATION TRANSMISSION (% OF TIME)	85%	74%	51%
SESSION SIZE (NO. PERSONS)	47	20	15
PARTIC./LEADER INTERACTION (%OF TIME)	18%	34%	34%
EXPOSURE TIME (HRS)	8 HRS	11 HRS	18HRS
PARTIC./PARTIC. INTERACTION (% OF TIME)	3%	12%	32%

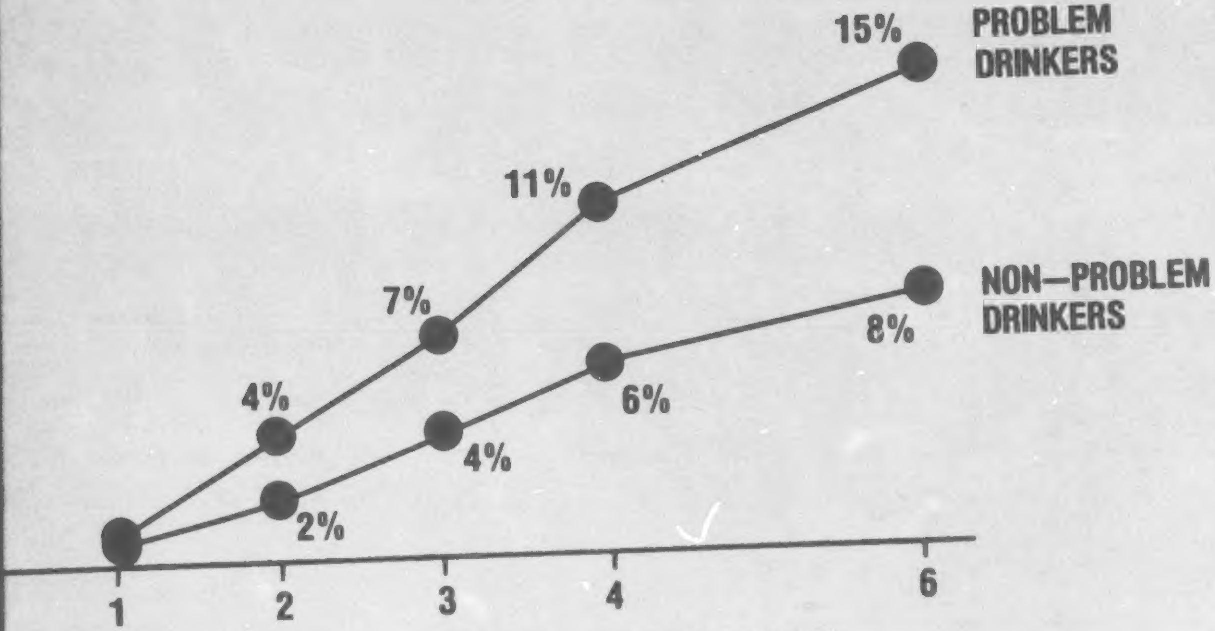
Source: Nichols and Reis (142)



Source: Nichols and Reis (142)

Figure 22

REARREST RATES FOR PROBLEM AND NONPROBLEM DRINKERS



Source: Nichols and Reis (142)

Figure 22

REARREST RATES FOR PROBLEM AND NONPROBLEM DRINKERS conducted.* As figure 22 indicates, there was a considerable difference in the subsequent rearrest rates for these two drinker groups. This difference was statistically significant and lent considerable support to the validity of the overall ASAP diagnostic process.

Finally, an analysis of the recidivism rates for *each drinker type* exposed to *each school type* was conducted. The general trend of the results of this analysis is shown in figure 23. Basically, for *nonproblem drinkers* it made no difference which school the clients were exposed to. The rearrest rates for both schools, on which sufficient data were available, were nearly the same.

With regard to *problem drinkers,* however, there was a trend for those persons exposed to a purely lecture-oriented (type 3) school to have a higher than expected recidivism (rearrest) rate. This difference, which was statistically significant at the end of the 1-year interval, did not reach such significance at the end of the 18-month interval.

A summary of the present state of affairs with regard to the effectiveness of various alcohol education schools would include the following:

- Studies measuring the effects of alcohol education schools in terms of positive *knowledge* or *attitude* changes provide fairly convincing evidence for such effect (140).
- Studies measuring the effects of alcohol education schools in terms of intermediate criteria (such as clients seeking further help for their drinking problem, clients reducing their quantity or frequency of drinking, or clients reducing their number of drinking-related problems) are nonexistent to date (140).
- Studies measuring the effects of alcohol education schools in terms of reductions in subsequent alcohol-related violations and crashes do not at present provide much support for the existence of such effects (140).
- There are some indications that lecture-oriented schools may have a negative effect on extreme problem drinkers in terms of subsequent alcohol-related arrests (142).
- Few ASAP's, up to 1974, had employed adequate experimental designs to evaluate the effectiveness of their educational programs (140, 142).
- Sample sizes in most of the studies reported to date were too small to be able to detect a 10-15-percent crash or violation reduction effect.
- Other studies conducted in the United States, as well as those few foreign studies which have been conducted, lend added support for the foregoing NHTSA findings.

B. Future Plans in the Driver Education Area

There are two separate offices within NHTSA that are jointly responsible for the proper administration of NHTSA's traffic safety education program. Most of the projects described in this and the previous section represent efforts of the Office of Driver and Pedestrian Research (ODPR) of Research and Development (R&D). This office, since its establishment in 1970 has been attempting to administer a research and development plan that complies with long-range needs. The driver task analysis, the development of instructional and performance objectives, and the development and pilot test of the SPC curriculum are all products of the efforts of this office and its Driver Education and Licensing Group.

In 1970, the large-scale demonstration program concept became a primary emphasis in NHTSA's countermeasure efforts with the advent of the Alcohol Countermeasures Program (ACP) and its 35 ASAP's.

Since that time, and as a direct result of the ASAP experience, the demonstration program concept has been developed and refined to the point where it now clearly refers to the large-scale implementation of countermeasure programs, in real-world environments, for the purpose of determining their crash reduction effectiveness. Early in the ACP the importance of the evaluation portion of

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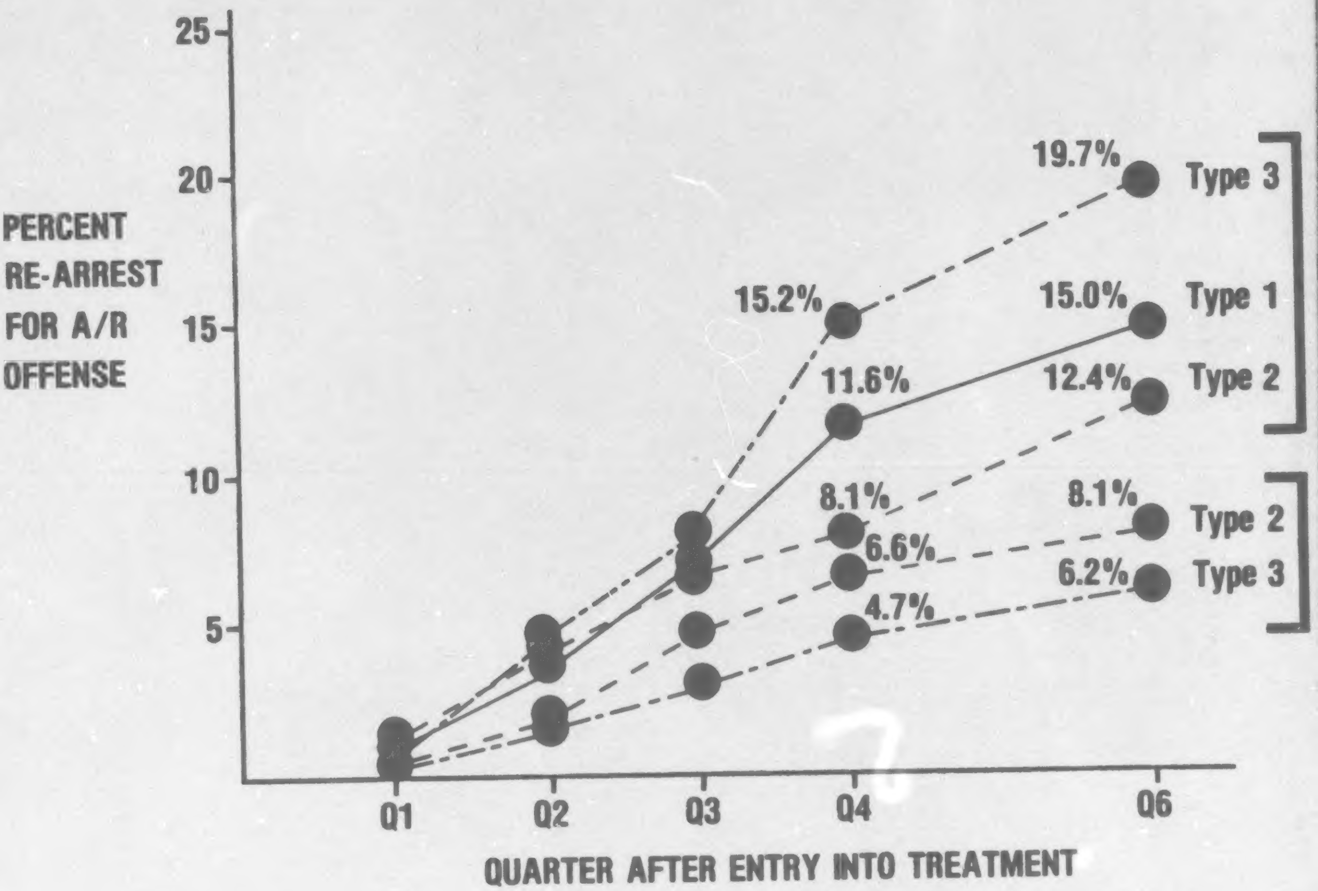
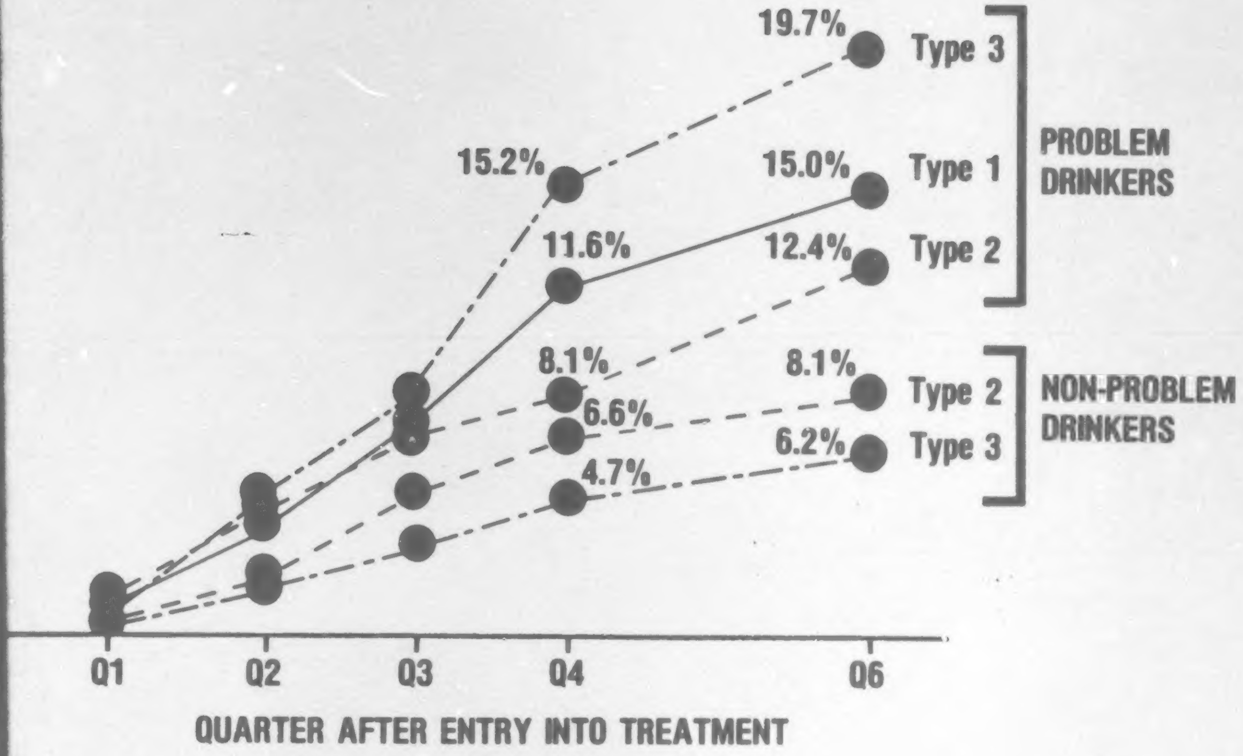
*Each project reported separate forms for persons diagnosed as problem and nonproblem drinkers. The diagnosis process varied from site to site. For a more complete explanation see reference 142.



Source: Nichols and Reis (142)

Figure 23

REARREST RATES FOR PROBLEM AND NONPROBLEM DRINKERS EXPOSED TO VARIOUS TYPES OF SCHOOL



Source: Nichols and Reis (142)

Figure 23

TES FOR PROBLEM AND NONPROBLEM DRINKERS EXPOSED TO VARIOUS TYPES OF SCHOOLS this definition was less than clear.* This demonstration program concept now constitutes the primary activity of the newly created Office of Driver and Pedestrian Programs (ODPP) of the operational Traffic Safety Programs (TSP) portion of NHTSA. As a result, the Driver Education and Licensing Group of the ODPR (R&D) and the Driver and Pedestrian Education Division of the ODPP (TSP) are working closely together to develop and pilot-test the various demonstration program components (R&D) and to actually implement and monitor those large-scale program evaluation efforts (TSP). This relationship provides the basis for the following discussion of multiyear plans.

Several traffic-safety-education-oriented demonstration programs are being developed for implementation before calendar year 1980. Because the highest priority is now being placed on the overlapping alcohol, youth, and motorcyclist target groups, the majority of the demonstration programs are in these areas. They include:

Alcohol and Other Drug Education and Training

- A Short-Term Rehabilitation Demonstration: This program is intended to evaluate the effectiveness of short-term behavior modification techniques (including educational and followup components) at present being surveyed by R&D. It probably will be the first in a series of similar projects.
- Alcohol Education Demonstration: A project intended to evaluate the effectiveness of a comprehensive community alcohol education program including elementary school, secondary school, court, and motor vehicle department components. Curricula will be developed in terms of instructional and performance objectives and will make use of the best of the materials available to date.

Young Driver Education and Training

- Innovative Teaching Techniques Demonstration: A program to evaluate the effectiveness of several existing and newly developed education approaches for young beginning drivers.

Motorcycle Driver Education and Training

- Motorcycle Driver Education and Training Demonstration: A project to evaluate a performance-based motorcycle driver education program that will be developed on the basis of instructional and performance objectives.

Adult Driver Education and Training

- Comprehensive Crash Avoidance Skills Demonstration Program: A project intended to evaluate the effectiveness of a comprehensive, community-based crash avoidance program that would include both defensive-driving and emergency-training components for all driver groups, in a variety of settings (e.g., school, industry, recreational, licensing).

Elderly Driver Education and Training

- Elderly Driver Education and Training Demonstration Program: A project intended to evaluate the effectiveness of a comprehensive, community-based education and training program for elderly drivers. Several approaches outlined in the "Issues" section of this report will be investigated and developed in the R&D preparation period for this project.

Driver Education and Training for the Handicapped

- Driver Education and Training for Handicapped Persons Demonstration: This project, which will probably be conducted in conjunction with HEW, will attempt to evaluate the driving-

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*It is apparent that, although an emphasis was placed on evaluation in this initial NHTSA demonstration effort, primary emphasis was placed on *reducing* crashes with apparently less emphasis being placed on reducing them in such a manner such that the effect could be documented. This emphasis has changed since 1970.

and non-driving-related social effects of a comprehensive driver education and training program for handicapped groups. Which handicapped groups will be included in this study will depend on the results of the ongoing R&D survey effort.

All of the foregoing projects will include immediate, intermediate, and long-range criteria for determining program effectiveness. Prerequisites for contract award will be the same as for demonstrations implemented at present, and include 1) capability to obtain an adequate sample size and 2) capability and willingness to employ random assignment techniques. In addition, biographical and demographic data will also be analyzed and manipulated statistically to eliminate potentially contaminating influences. It is apparent that the NHTSA emphasis is primarily on conducting and stimulating adequate evaluation programs. This approach, in addition to providing information with regard to the programs being evaluated, should provide a needed stimulus or model for similar State program evaluation efforts.

Section Nine

SUMMARY AND RECOMMENDATIONS

A. Summary

In summary of the preceding sections, the following information is offered:

Section Two: Context

- Section two suggests, with somewhat convincing evidence, that the highway transportation system in the United States is operating with a considerable degree of efficiency in terms of crash involvement per licensed driver or per miles driven.
- This section also suggests that "silver bullet" approaches, or expectations of dramatic crash reductions, are not logically sound. Considerable effort has already been expended to minimize highway-related death and injury rates in the United States. Further reductions will be much more difficult to effect.
- Exceptions to the foregoing suggestion would require a program or an event that would dramatically restrict either 1) *how much* the public drives or 2) *how* the public drives. One example of such an event would be the effect of the 1973-74 fuel shortage on miles driven, on the speed at which they were driven, and subsequently on the reduced crash rate for that time period. Only in crisis situations–or with the recognition of long-term national interest–is it likely that the public will accept such restrictions.
- Traffic safety education is only one of several countermeasure approaches that can be supported in order to maintain or improve the safety status of the highway traffic system.

Section Three: Target Groups

- Information presented in section three suggests that young drivers represent the most problematic group with regard to crash involvement and, from that point of view, offer the greatest potential for reducing crashes of any target group.
- Programs aimed at drinking drivers and motorcyclists and general adult target groups also provide a significant potential for crash reduction.
- Driver errors continue to be the single greatest contributing factor in the causation of highway crashes.

Section Four: History

- Section four provides a chronology of events in the history of High School Driver Education (HSDE) efforts, and suggests four stages to describe that history of events. These stages include: 1) a period of relatively uncontrolled development, 2) a period of expansion and attempts to organize the area, 3) a period of criticism of HSDE effectiveness, and 4) a period of increased accountability and emphasis on curriculum development and evaluation.
- The Highway Safety Act of 1966 and its resultant research and development efforts (sec. 403 of the act), have contributed significantly to the development of a model for HSDE curriculum development and evaluation.
- Unfortunately, the primary impact of the Driver Education Standard which developed from the 1966 act (sec. 402), has been to emphasize further the expansion of HSDE in the States before programs have been developed adequately and their effectiveness documented. This effect has continued in spite of the specific criticisms of this aspect of HSDE in the late 1960's.

- Much emphasis in the driver education areas is now being placed on education programs for a variety of driver groups, on multiphase programs for the secondary school, and on performance-based (rather than time-based) programs.
- Approximately 73 percent (or about 2.6 million) of eligible students are now being exposed to HSDE efforts at an estimated annual cost of at least $200 million (2.6 million students at $76.32 per student).

Section Five: Effectiveness of HSDE

- The goal of HSDE, as a federally subsidized highway safety measure, is to reduce crashes.
- Section five points out that early studies, which claimed HSDE to be 50-percent effective in reducing crashes and violations, had gross methodological deficiencies and that their conclusions were incorrect.
- Studies by independent researchers accounted for most of such claimed effect in terms of differences in exposure, personality, or other self-selection factors.
- Recent studies have involved more substantial efforts to control for such extraneous variables, but no such study has succeeded in producing unequivocal results concerning HSDE effectiveness (or the lack of it).
- No study is capable of *proving* that HSDE is (or is not) effective in reducing crashes. Further, only a substantial body of controlled investigations with relatively consistent findings can provide acceptable support for such an effect, or the lack of it.
- To date there is no acceptable experimental evaluation of HSDE. Studies by critics, as well as studies by proponents, have contained substantial methodological problems.

Section Six: Issues

- The most proper way in which to determine the effectiveness of driver education is by means of a study based on a random assignment, control group, experimental design.
- Driver education programs cannot be expected to improve unless they are implemented in a manner that allows accurate feedback with regard to their present effectiveness. Without such feedback, there is no incentive to modify such programs.
- The history of HSDE appears to have skipped the developmental requirements of 1) objective-based curricula and 2) program-evaluation-documenting effectiveness before program expansion begins.
- Two of the reasons for the difficulty in evaluating HSDE are the commonly held belief that it is effective, and the fact that insurance companies and some State licensing agencies provide incentives for HSDE graduates based on this undocumented assumption.
- An additional reason for the difficulty in documenting crash reduction effectiveness is that the variation due to error and procedural differences in motor vehicle records may be as great as the variation effect (i.e., reduction) that is expected to result from a particular program.
- There is obviously extreme variation among HSDE programs, with regard to teacher preparation, program content, and facilities available. It would be difficult to support guidelines intended to improve course standardization in these areas without some objective research evidence concerning the factors that are important in contributing to program effectiveness (e.g., the use of professional vs. paraprofessional instructors for in-car training).
- The instructor, his motivation, and his competence are probably the most significant variables that contribute to potential HSDE effectiveness. How to identify, quantify, develop, and evaluate such instructor factors involves a very extensive evaluation process that has not been adequately pursued to date.

- The driver education concept has been expanded to a number of overlapping target groups, including 1) drinking drivers, 2) special vehicle groups, 3) elderly persons, 4) handicapped persons, 5) problem drivers, and 6) general adult populations. Collectively, such programs, with the addition of predriver (K-12) programs, constitute the traffic safety education area.

Section Seven: NHTSA Approach to Evaluating the HSDE Area

- Following the recommendations of the Highway Research Board in 1968, the National Highway Traffic Safety Administration (NHTSA) has pursued a long-term plan aimed at the development of an objective- and performance-based HSDE curriculum.
- The development and pilot testing of this curriculum has proved to be a considerable stimulus for the improvement of existing HSDE programs.
- An initial pilot test of this program has provided indications that, with some adjustments, the program will be acceptably effective in meeting its instructional and performance objectives.
- An assessment of the effectiveness of this program, in terms of crash reduction, will be pursued in demonstration programs to be implemented in the near future.
- The NHTSA has taken the position that an HSDE program that is 10-15-percent effective in reducing the crash involvement probability of persons exposed to it is feasible and represents a reasonable expectation.
- Such an effective program, even if implemented on a massive scale, would not result in a *dramatic* overall crash reduction. Such a program, however, would be cost effective.

Section Eight: Other NHTSA Education Activities

- A demonstration program concept provides the basis for the current NHTSA approach in this area. Such programs are developed and initiated for the express purpose of evaluating the crash reduction potential of various educational countermeasures approaches. Research and development efforts are being directed to the development of the countermeasure components for such projects.
- Contrary to the suggestions by some researchers (33), the research evidence does *not* support the conclusion that "more directive" programs, such as court or motor vehicle programs, provide more potential for behavior modification than does HSDE. On the contrary, it appears that controlled studies in the driver improvement area (137) and in the alcohol education area (140, 142) have shown no consistent positive findings with regard to the effectiveness of such programs in reducing crashes, and controlled studies in industry are particularly absent. Further, there appear to be just as many poorly controlled studies reporting positive program effects in HSDE as in any other area.

B. A General Observation

The question regarding the effectiveness of present HSDE programs is difficult to answer. There are so many diverse programs, so few of which have had any evaluation, that any conclusion regarding the overall effect of HSDE is reduced to little more than a "feel" for the situation. One thing appears to be certain. Such programs are *not* 50-percent effective in reducing crashes and violations as was previously claimed. However, unlike McGuire and Kersh, who tentatively concluded that HSDE, as now constituted, offers little or no promise of contributing to driver behavior modification, NHTSA believes that HSDE offers as much behavior modification and crash reduction potential as any other form of short-term intervention. In fact, it probably offers more potential than most programs because it intervenes earlier and involves more time than most of the other approaches. However, HSDE probably does not offer the same potential as an integrated safety education approach aimed at the early years. Ironically enough, the McGuire and Kersh report suggests that before the advent of HSDE programs instruction in traffic safety *was* provided by the schools and *integrated with other courses* taught at the secondary or elementary level. To the extent that this was (or would have continued to be) the case is difficult to determine. However, while the desirability of such an integrated approach is reasonably logical from a human learning point of view, it is not felt that such an approach obviates the need for a formal HSDE program.

C. Recommendations

With regard to the future role of driver education as a traffic safety countermeasure, it is felt than many of the recommendations made by McGuire and Kersh (33) in 1969 still hold today. They felt that the question of driver education effectiveness should be subjected to more rigorous experimental designs specifically involving randomly assigned groups. Before-the-fact rather than after-the-fact studies were completely within the realm of possibility at that time, and should have been initiated immediately. Furthermore, they considered it in the national interest to evaluate critically all social and educational programs against carefully defined goals and objectives, and that any expansion of such programs without such proof of effectiveness would not be in the national interest.

Some of the specific recommendations made in that 1969 report, which are considered to be sufficiently relevant to be repeated at this time, include the following:

> If crash reduction is accepted as a primary goal of HSDE [which NHTSA feels is the case] then immediate priority should be given to the further evaluation of various types of programs using death, injury and property damage as the primary criteria of success. In this research, careful attention should be given to the important variables of course content, pupil differences, teacher differences, school differences, and number of course hours.
>
> If some existing courses, and/or parts of them show an ability to reduce accidents, such courses should form the basis for developing and refining a single driver education curriculum that should replace all others of lesser effect.
>
> If subsequent research [in a particular locality] indicates that no existing program is capable of influencing the accident rate, then new, experimental programs should be devised and appropriately evaluated. Those programs, however, should be . . . large enough only to satisfy the requirements of good experimental design.

In addition to the foregoing evaluation recommendation offered by McGuire and Kersh, the following program-development-oriented recommendations made by Goldstein (16) are also considered to be relevant at this time:

- A more detailed and comprehensive review of the literature relevant to influencing driver behavior should be made. This review should include research dealing with more general human behavior as well as specific driving behavior in an attempt to develop new approaches to modifying the latter.
- A diagnostic remedial approach to driver preparation (and to driver licensing and driver improvement as well) should be pursued and evaluated. Such an approach would be based on the individual differences that exist in any target population, and would attempt to develop custom programs based on some of the more important differences.
- Alcohol should receive considerable attention in any current program.
- Parent-participation approaches to the behind-the-wheel (BTW) phase of HSDE should be developed and evaluated.
- Precourse preparation by parents should be explored and evaluated.

- The effectiveness of integrating traffic safety into the subject matter of other courses should be investigated.

In addition to these earlier recommendations, the following recommendations, which would primarily affect State and local programs, are offered:

- Immediate consideration by NHTSA should be given to modifying the Driver Education Standard to reflect the increased emphasis on evaluation suggested throughout this report and apparent in the recommendations of McGuire and Kersh. Equal emphasis should be placed on the development and proper evaluation of innovative driver education approaches. This effort should be made in recognition that it will be impossible for the Federal Government to investigate adequately all the areas of driver education that require investigation, or to provide a sufficient body of research results with regard to even limited areas of interest.
- Any such standard revision should be designed to stimulate development and evaluation efforts in the States and localities, and should make the availability of funds *primarily* dependent on meeting such requirements rather than on meeting program expansion requirements.
- Considerably more emphasis should be placed on the development and proper evaluation of K-12 safety education programs in various States, because such programs may offer a greater potential for success. It is of primary importance, however, that such evaluations be properly designed and carried out owing to the long period of time required to document the crash reduction potential of such programs.
- Considerably more evaluation emphasis should be placed on investigating instructor characteristics, such as background preparation, motivation, driving records, and current assignments and responsibilities.* Such factors should be evaluated in relation to the subsequent driving records of students. (For example, students might be randomly assigned to those instructors whose primary assignments are in HSDE and to those whose primary assignments are in physical education. Subsequent records of students from both groups could be followed up and compared.)
- Evaluation emphasis should also be placed on the effectiveness and cost effectiveness of the use of driving simulators and multicar ranges for driver education and training.

Finally, with regard to specific NHTSA research, development, and demonstration efforts, the following recommendations are provided:

- The Safe Performance Curriculum (SPC) should be evaluated by random assignment of students to groups receiving and not receiving the program. Sufficient numbers should be trained and followed up to permit a determination of SPC's crash reduction potential.
- Further development and evaluation of SPC should occur to permit a determination of which components of the program are cost effective. Once the instructional program phase of the SPC demonstration has been completed and the attainment of instructional objectives documented, States should be encouraged to take all or part of the SPC curriculum for implementation and evaluation. Based on the pooled results of NHTSA and State evaluations, sufficient data should be available to determine which parts are effective (and not effective) in different situations, and how much they cost to implement. From these data, NHTSA and the States can design a comprehensive and cost-effective driver education program.

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*Such emphasis is most important, because the instructor is probably the single greatest contributing factor in determining whether a driver education program will have a desired effect.

- The effectiveness of NHTSA-developed innovative programs in accident avoidance skills training, designed around accident causative factors, should be evaluated both in conjunction with and in contrast to defensive-driving training techniques. Furthermore, the applicability of these techniques for beginning driver education as well as advanced driver training should be determined.
- Innovative approaches to help foster safe and efficient driving should be developed for beginning and advanced driver training. Particular attention should be given to improving the quality of BTW training for beginning drivers. When innovative techniques have been developed, decisions can be made on whether to incorporate them into a more comprehensive driver education demonstration or to compare them with existing techniques.
- The development of diagnostic remedial approaches, particularly for problem and adult drivers, should be continued. The education emphasis should be placed on modifying the behavioral factors that cause particular driving problems. These educational techniques would most likely be implemented and evaluated in a driver-licensing or traffic court setting.
- Because of an apparent increase in the use of alcohol by young people, K-12 programs should be developed and evaluated that attempt to counteract the excessive use of alcohol, especially during or before driving. Attempts should be made to determine at what period in such a K-12 program various education approaches would be most effective.

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Appendix A

HIGHWAY SAFETY PROGRAM STANDARD 4

DRIVER EDUCATION

Purpose

To ensure that every eligible high school student has the opportunity to enroll in a course of instruction designed to train him to drive skillfully and as safely as possible under all traffic and roadway conditions.

To ensure that commercial driver training schools achieve and maintain a corresponding level of instruction for beginning drivers with recognition of differences between the needs of adults and adolescents.

To provide education courses offering driving instruction to adults.

Standard

Each State, in cooperation with its political subdivisions, shall have a driver education and training program. This program shall provide at least that:

1. There is a driver education program available to all youths of licensing age which:
    a. Is taught by instructors certified by the State as qualified for these purposes.
    b. Provides each student with practice driving and instruction in at least the following:
        1) Basic and advanced driving techniques, including techniques for handling emergencies.
        2) Rules of the road and other State laws and local motor vehicle laws and ordinances.
        3) Critical vehicle systems and subsystems requiring preventive maintenance.
        4) The vehicle, highway, and community features
            a. that aid the driver in avoiding crashes,
            b. that protect him and his passengers in crashes,
            c. that maximize the salvage of the injured.
        5) Signs, signals, and highway markings, and highway design features which require understanding for safe operation of motor vehicles.
        6) Differences in characteristics of urban and rural driving, including safe use of modern expressways.
        7) Pedestrian safety.
    c. Encourages students participating in the program to enroll in first aid training.
2. There is a State research and development program including adequate research, development and procurement of practice driving facilities, simulators, and other similar teaching aids for both school and other driver training use.
3. There is a program for adult driver training and retraining.

4. Commercial driving schools are licensed and commercial driving instructors are certified in accordance with specific criteria adopted by the State.
5. The program shall be periodically evaluated by the State, and the National Highway Traffic Safety Administration shall be provided with an evaluation summary.

NOTE: An elaboration of the meaning of this Standard is provided in the Driver Education portion (Volume 4) of the NHTSA's Highway Safety Program Manual. This Manual is designed as a guide for the States and their political subdivisions to use in developing highway safety program policies and procedures.

This document is for sale (Price $1.55) by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Stock Number 5003-00186.

Appendix B

STATUTORY AUTHORITY FOR THE HIGHWAY SAFETY STANDARD ON DRIVER EDUCATION

The basic national legislative authority for the Program Standard on driver education is contained in Chapter 4 of Title 23, U.S.C. (hereinafter referred to as the Highway Safety Act of 1966), which states in Section 402(a):

> "Each State shall have a highway safety program approved by the Secretary, designed to reduce traffic accidents and deaths, injuries, and property damage resulting therefrom. Such programs shall be in accordance with uniform standards promulgated by the Secretary. Such uniform standards shall be expressed in terms of performance criteria. Such uniform standards shall be promulgated by the Secretary so as to improve driver performance (including, but not limited to, driver education. . .)."

Section 402(b)(1)(E) of Title 23, U.S.C., supports the basic authority by stating that:

> "The Secretary shall not approve any State highway safety program under this section which does not. . .provide for comprehensive driver training programs, including (1) the initiation of a State program for driver education in the school systems or for a significant expansion and improvement of such a program already in existence, to be administered by appropriate school officials under the supervision of the Governor as set forth in subparagraph (A) of this paragraph; (2) the training of qualified school instructors and their certification; (3) appropriate regulation of other driver training schools, including licensing of the schools and certification of their instructors; (4) adult driver training programs and programs for the retraining of selected drivers; and (5) adequate research, development and procurement of practice driving facilities, simulators, and other similar teaching aids for both school and other driver training use."